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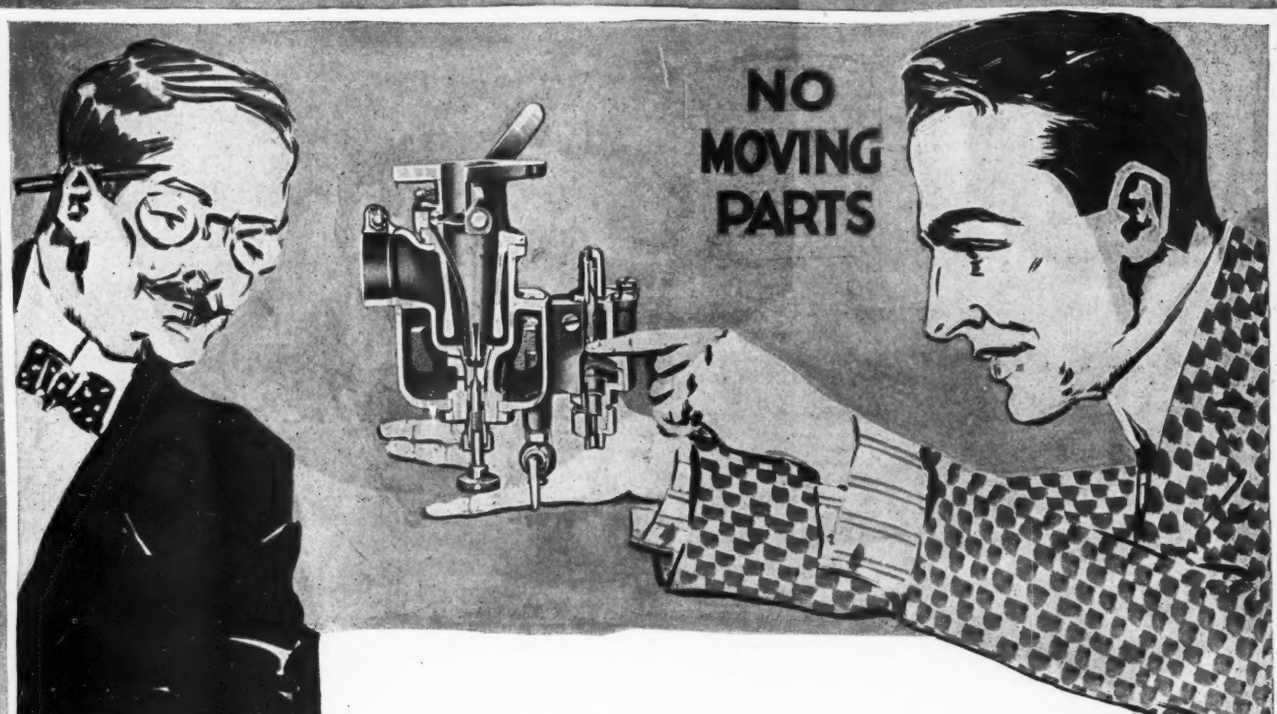
MOTOR AGE

VOLUME XXIII CHICAGO, JANUARY 9, 1913 NUMBER 2



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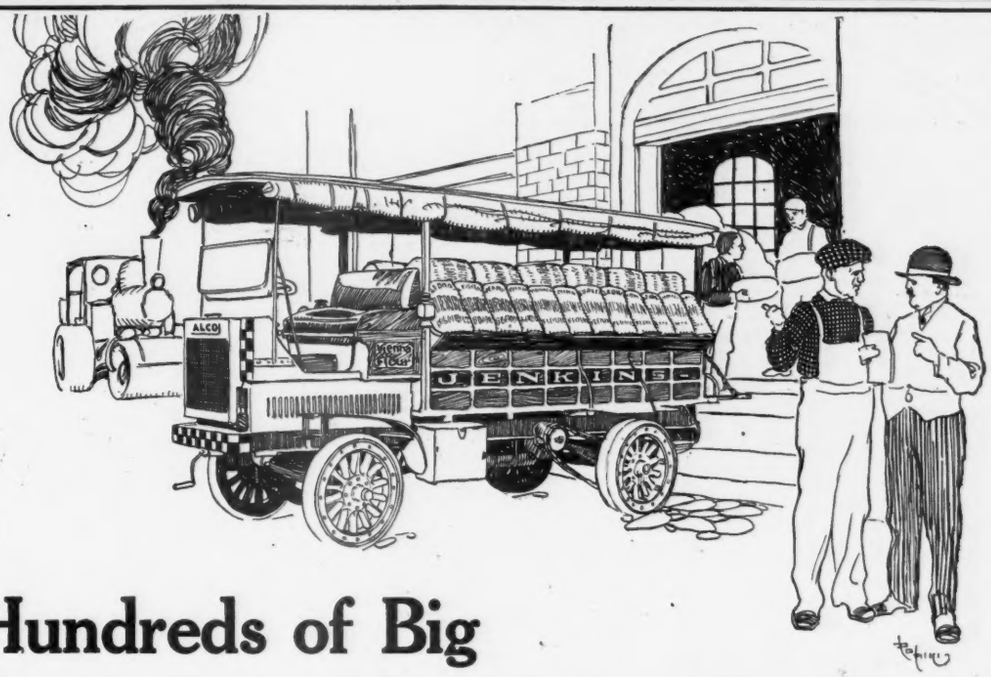

Hundreds of Big Firms Save Money by Alco Trucks

One Alco truck is displacing six horses; another eight; another ten; another eighteen; another twenty. One saves 66 per cent; another saves 20 cents a ton; another delivers 150 miles a day. Alco trucks are saving in 103 different lines of business. Below are specific instances:

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Carlson & Torell of Hartford, Conn., make 80 miles a day now—horses did well to make ten. John Quinlan of Montreal has four trailers attached to his Alco, and hauls on each trip 18 tons. Palmer Bros. Construction Company of San Diego, Cal., move houses with their Alco.

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One Alco in service of the South Lincoln Dairy Supply Company of Boston displaces 9 horses. The Alco truck owned by Levy Dairy Company of New York replaces 8 horses.

Dry Goods
Save 33⅓ Per Cent on Delivery Costs

Lord & Taylor of New York City use their Alco day or night. The Spokane Dry Goods Company are saving 33⅓ per cent.

Express
$290,000 Their Alco Investment

Over $290,000 is invested in Alco trucks by express companies. One company has over $136,000 in Alcos. The American Express Company operate 28, the Long Island Express 20, Westcott Express Company 12, Wells Fargo 6.

Farmers
Increase Profits $22 a Trip

Alfred P. Griffith of Azusa, Cal., saves $30 a month in salaries alone by his Alco. Charles Siedler of Maxville, Mo., profits $22 per trip.

Furniture
Save Over $100 Per Month

G. C. Flint & Company of New York now accomplish with one Alco in one day work that horses did in two days. The Kennedy Furniture Company of Chicago have tripled their radius of delivery.

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6 Alcos Replace 36 Horses

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ALCO
Motor Trucks
6½ Ton 5 Ton 3½ Ton 2 Ton

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Does Work of 20 Horses

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Two Alcos in the service of the Newburg Motor Transportation Company of Los Angeles displaces six 2-horse teams. Each loads up in two minutes. Watson & Pittinger of Brooklyn, load lumber on their Alco in two minutes by a special device.

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Deliver 150 Miles a Day

The Liberty Storage and Warehouse Company of New York have moved goods in one day formerly requiring three by horses. Bosworth Bros. of Chicago often deliver furniture 150 miles.

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Nearly all the big packers own Alcos—Morris & Company, Swift & Company, Armour & Company, and so on. Morris has ten. Roberts & Oake of Chicago have two Alcos, which average a dividend of 47 per cent.

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Holzhausen & Duncan of Los Angeles earn $8 a load. The Cartwright Draying Company of San Francisco use a trailer which gives them 8 tons to a trip.

If Alco trucks save money in these lines of business, they may save money for you in your line of business. Write today for data about Alco trucks in your own business—contained in the new 112-page book on the Alco. Sent gratis. Address: Division A

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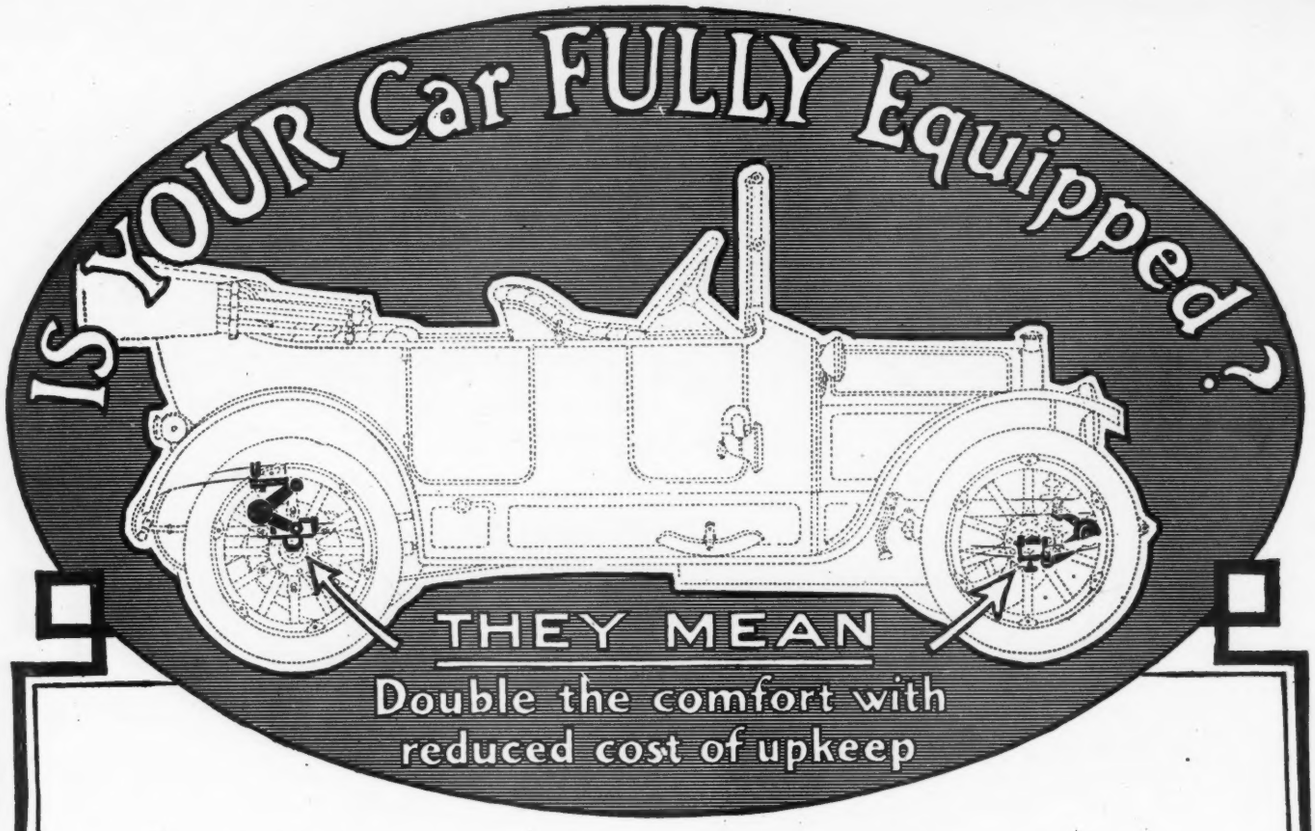

CONSTRUCTIONALLY, the automobile has reached a stage of development which leaves little to be desired. Its builders are now concentrating their attention on equipment which has become a matter of supreme importance. Accessories which add to *the comfort and luxury of motoring* are being generally adopted as *regular equipment*. Years before accessories were even seriously considered, the

Truffault-Hartford SHOCK ABSORBER

was regular equipment on most of the best known American cars, because it has always been considered more in the light of a *necessity* than an accessory. Today such cars as these are *factory-equipped with Truffault-Hartford Shock Absorbers:*

PACKARD	NATIONAL	BENZ	PREMIER	COLUMBIA
ALCO	MERCER	FIAT SIX	STODDARD-DAYTON	METALLURGIQUE
MARMON	OLDSMOBILE	HUDSON SIX	CORBITT	BRUSH
STEVENS-DURYEA	THOMAS	CHADWICK	McFARLAN SIX	AMERICAN 50
				NYBERG

A car is not *completely* equipped if it is not Truffault-Hartford-equipped. You will realize this as soon as you ride on a set. For comfort, for *economical upkeep*, for *real immunity from spring breakage and from excessive tire ills*, the Truffault-Hartford is *indispensable*. Ask any of the 200,000 and more motorists now using it.

There's a set for your car and a blueprint showing how to put it on.

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MOTOR AGE

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Contents

DEPARTMENTS

VOL. XXIII, NO. 2 CHICAGO, JANUARY 9, 1913 $3.00 PER YEAR

MOTOR AGE

The Motor Kaleidoscope

By Darwin S. Hatch

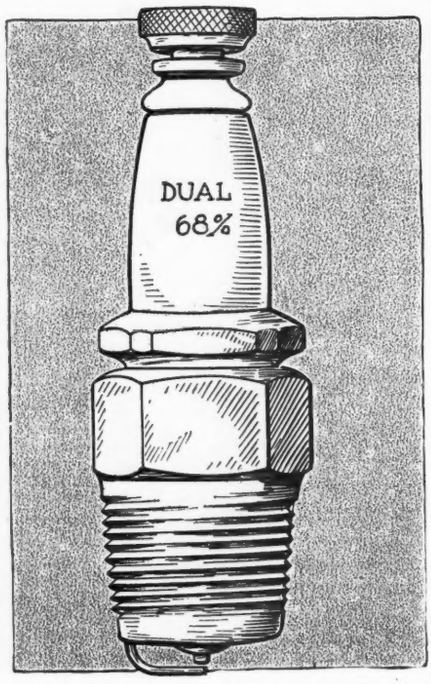
WITH the opening of the first American exhibition of 1913 motor cars at the Madison Square garden and Grand Central palace this week, the eyes of the motoring fraternity will be turned to New York for the first comprehensive view of the offerings of the industry for the year. The world of motordom has come to expect at the New York shows a concrete indication of the progress made during the preceding 12 months. Nor will it be disappointed this year, for the cars and chassis displayed will embody many refinements of detail, many novelties of construction and many developments of design upon which the engineers have been devoting their efforts.

Students of the car will see the introduction to the commercially saleable vehicle of an entirely new type of motor and will miss from the stands an old friend in the form of the two-cycle motor. The new type of motor is the rotary-valve motor which will appear in six-cylinder form as a product of the Speedwell factory. Its appearance marks the entrance into the motor car field of a third type of motor entirely different in principle of valve operation from any heretofore employed in America. It joins with the Knight sleeve-valve motors and against the older poppet-valve type in bidding for popular approval.

Gradually diminishing as it has been in popular esteem for many years, the two-cycle motor has practically disappeared from the pleasure car field, its only adherent being that pioneer in the motor industry, Duryea. The Amplex, Atlas and Elmore have all abandoned their allegiance to the two-cycle power plant, Amplex and Atlas have turned, one to the Knight and the other to the four-cycle poppet valve, while the Elmore has bravely gone down with the ship and quit manufacturing altogether.

Many New Faces in Ranks

Many unfamiliar name plates will be noticed among those on the cars lined up for inspection, this year for there have been a score or more of new cars added to the industry since the beginning of 1912. Among these may be mentioned the A.E.C., Burg, Carroll, Crane, Detroiter, Croxton, Duquesne, Henderson, Holly, Keeton, Little, Moyer, Omaha, Pacific, Perfex, Scout, Senator, Chevrolet and Edwards. Also there are a number of cars bearing new names but are the products of factories which have been on the market before with motor cars under other appelations. Such is the new Flanders six, which comes from the factory whose products were formerly known as the Everitt; such is the Touraine, which formerly appeared as the Nance; such are two of the Studebaker models, one of which enjoyed such popularity as the Flanders, and the other

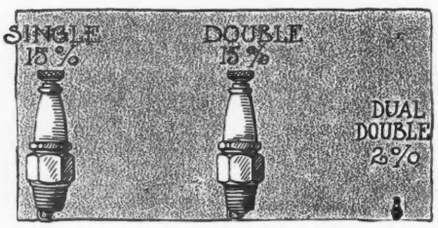


as the E.M.F. The Croxton and Kenton are two new cars which are the result of a dismemberment of the old Croxton-Kenton.

Along with this array of new faces it will be noticed that there has disappeared from the ranks of cars on the market an even greater number whose names had become familiar to the buying public, but which for one reason or another are not among those produced for the following year. The mere fact that these cars have not answered the roll call does not mean in every instance that they are no longer being manufactured. In some cases it means that the plans of the makers are not decided upon at this time to an extent where they can be made known to the public; in others litigation or financial difficulties have required the temporary suspension of activities at the time. So the fact that they are mentioned among the missing at this writing does not mean in every case that 1913 models will not appear sometime during the year. In most cases, however, the fact that these cars are listed among the missing means a definite retirement of their makers from the pleasure car industry.

Old Friends Disappear

The list of car names which up-to-date have not appeared on the 1913 market is a long one and includes the Anna, Alpena, Babcock, Brush, Corbin, Dalton, DeTamble, Dispatch, Elmore, Frontenac, Grant, Henry, Illinois, Jonz, Leader, Marquette, Parry, Otto, Penn, Petrel, Reading, Ritter, Roader, Rogers, Sebring, Shelby, Stafford, Thomas, Stuyvesant, W.F.S., Suburban, Union and Virginia. Other makers have suspended the production of pleasure vehicles and devoted themselves exclusively to the commercial field. These include Autocar, Clark, Four-Wheel-Drive, Johnson and Wilcox.



COMPARING THE POPULARITY OF THE FOUR IGNITION SYSTEMS

This shake-up in the motor car industry which has taken place within the past 12 months, with the dropping out of old makers and the entrance in the field of new ones, has had a distinct effect upon the field as a whole. The number of makers has dropped in the past year from 193 in 1912 to 156 in 1913. This is a loss to the industry of nearly 20 per cent. It also means a corresponding decrease in the number of different car models from which the prospective buyer has to choose. The 1,128 car models offered for the inspection of the motorist at the beginning of the 1912 season has been reduced to 908. This may, however, be a blessing in disguise to the prospective owner as it will relieve him at least to some extent, of the embarrassment of riches of car styles which have previously been offered for his inspection.

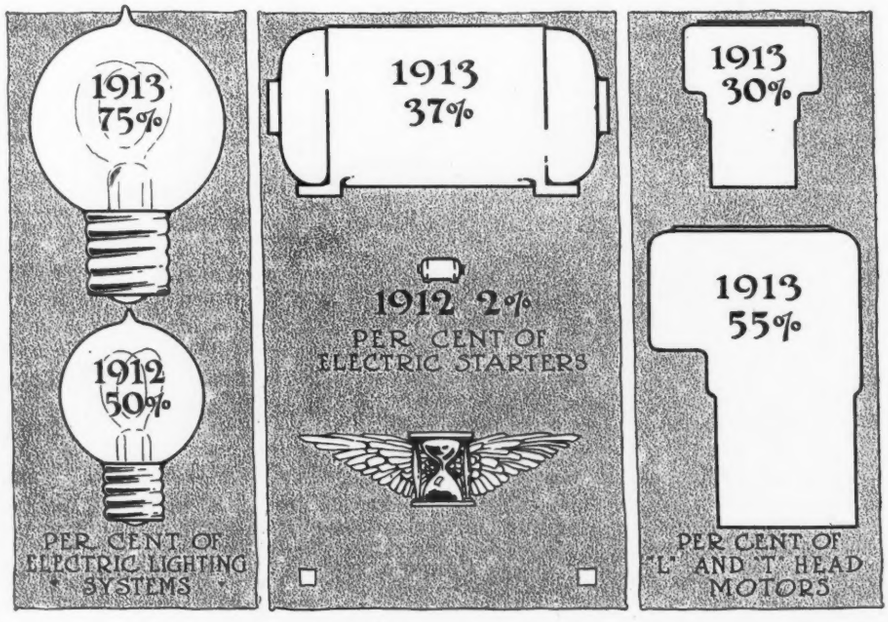
Wide Choice Offered.

Prospective owners will find, however, that although the number to choose from has been somewhat curtailed, this loss is more than made up for by the increased desirability of the industry's offerings for the new season. There has been a wonderful development among motor cars since the beginning of 1912 and particularly in the major features which first appeal to the man who is looking over the ground with respect to the car for his own use. Complete equipment has come to be the rule rather than the exception. A car which is not listed complete with windshield, top, top-boot, some type of motor starter, and electric lights will find itself in the minority. On many there is listed as stock equipment, some form of storm curtain which can be put on and taken off in an instant without necessitating the disagreeable task of standing out in the rain to do it.

Perhaps nothing will show this effort of catering to the luxurious tastes of the modern motor car buyer so much as the wonderful strides which have been made in the adoption of motor starters and of electric lights. Seventy per cent of the motor cars on the 1913 market are equipped with motor starters of one type or another, while less than one-third of the cars rely upon the out-of-date and laborious hand crank. The dominant feature of the motor car field this year is the amazing gain in popularity of the electric starter.

Developments of Year

From a bare three or four cars fitted with electric starting and lighting systems in 1912, the number has jumped to 124 this year, that is, 37 per cent, or better than one-third of the cars for the 1913 market will have electric starting and lighting systems. The acetylene gas starters, which were the subject of so much comment last year and which bade fair to be almost universally adopted, reached the height of their popularity early in the spring and the rapidity of desertion from the acetylene to the electric starter has made the former a very bad second to the electric in point of number of cars using it. Only 14 per cent of 1913 cars are equipped with acetylene starters, which is but slightly better than one-third as many as have electric starters. The other types of mechanical, gasoline and air



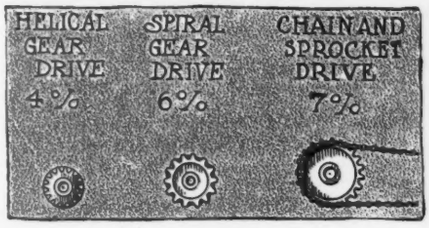
GRAPHIC ILLUSTRATION OF GROWTH OF ELECTRIC LIGHTING AND ELECTRIC STARTING WITH COMPARISON OF MOTOR TYPES

starting devices have lost slightly in popularity to the electric.

Electric lighting has gained in the approval of motorists even more rapidly than have electric starters, and though the older and more simple type of electric lighting system with the battery alone has retained some of its advocates, particularly among the lower-priced cars, the so-called dynamo-electric lighting systems have gained in popularity much more rapidly.

Almost as remarkable as the growth of the starter has been that of the six-cylinder motor. Whereas only 19 per cent of the cars of last year were sixes, almost double that number, or 36 per cent, have six-cylinder power plants now. A feature of as great importance is the lowering of the price of the six-cylinder car and particularly the entrance of the six into the medium-price class of cars. There is quite a number of six-cylinders now selling at less than $2,000, which brings them within the reach of the ordinary motorist, one or two selling as low as $1,600.

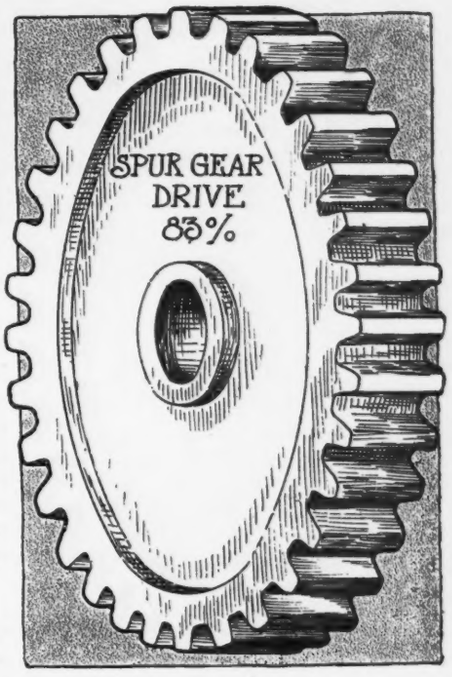
Prices of 1913 cars as a whole have not decreased, contrary to the expectation of many who have been looking for a good many years for a decided cut in list prices. Nevertheless, there has been a decided movement in prices toward a more uniform one. That is, the tendency seems to be toward a uniform average price which is very close to $2,500; in fact, the average in all the cars on the 1913 market is $2,585. During the past year, makers of cars listed above $2,500 have shown a tendency to decrease the price, while those listing cars at less than this price in the main have raised them somewhat. Of course, there are many notable exceptions to this, but the general trend seems toward a definite medium price. This accounts for the great increase in the number of cars selling between $2,000 and $3,000, with corresponding decrease in those listed above and below this price. There are certain fundamental reasons why an increase in the list price of the cheaper cars, the chief one of which is the added expense of the increased equipment and particularly the fitting of motor starters and electric lighting systems with generator and battery.



COMPARATIVE STRENGTH OF FOUR CAMSHAFT DRIVES

Effect of Foreign Designs

European practice has made a greater impression upon the American cars this year than ever before and the adoption of European ideas, so far as it has gone, has been for the betterment, American engineers seeming to pick out the good things in European design without attempting to adopt those of doubtful value. Wire wheels are perhaps the best instance of European influence. There are at present eight makers who fit wire wheels either as standard equipment or at the option of the purchaser. In every case, these wire wheels are demountable, and some of them have the added feature of demountable rims, the latter being strictly an American institution. Another new thing coming in is the V-shaped radiator which has been adopted this year by several makers, particularly on the cars intended for speed purposes. Some of the cars with the angular radiator are the Knox, Oakland and Abbott-Detroit, while the Jackson has a D-shaped front. A third evidence of European influence is the adoption by so many of the dash gasoline tank.

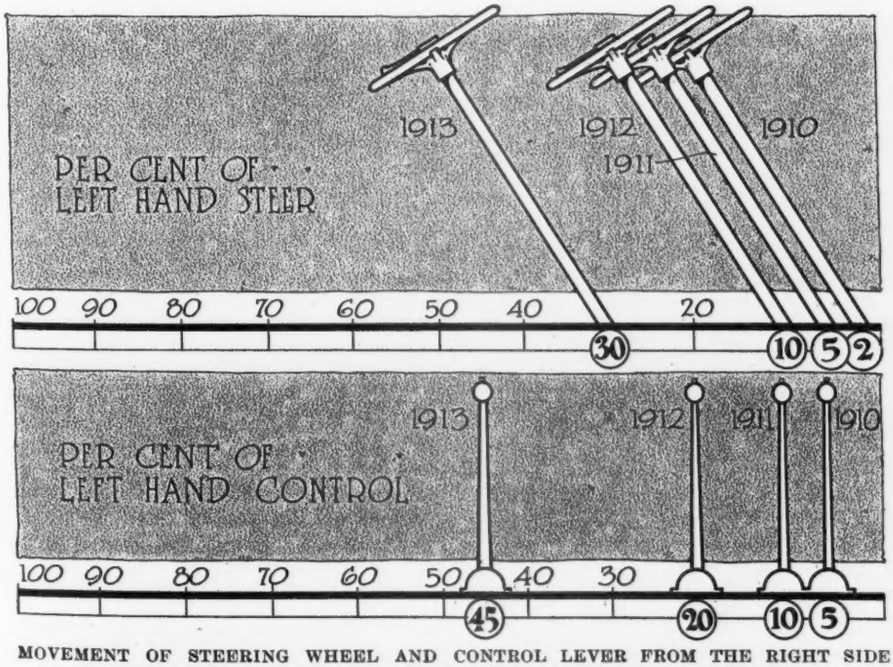


The several advantages of this location over the older and more inconvenient ones are numerous. It gives a direct, short feed line to the carbureter, makes the application of a gasoline gauge very easy, allows the tank to be filled without disturbing driver or passengers and also permits the automatic priming of the motor from the seat. Some of the makers to adopt this are the Hupmobile, Moline, Case, Carter-car and others.

The location of the headlights has been a point of development in this year's cars and some very interesting ideas have been worked out in this respect. The new Garford six is perhaps the most unique from this point of view, having a single headlight inset in the radiator so that the lamp is cooled by the water and also is thoroughly protected. Other makers have installed the headlights in the apron below the end of the front fender.

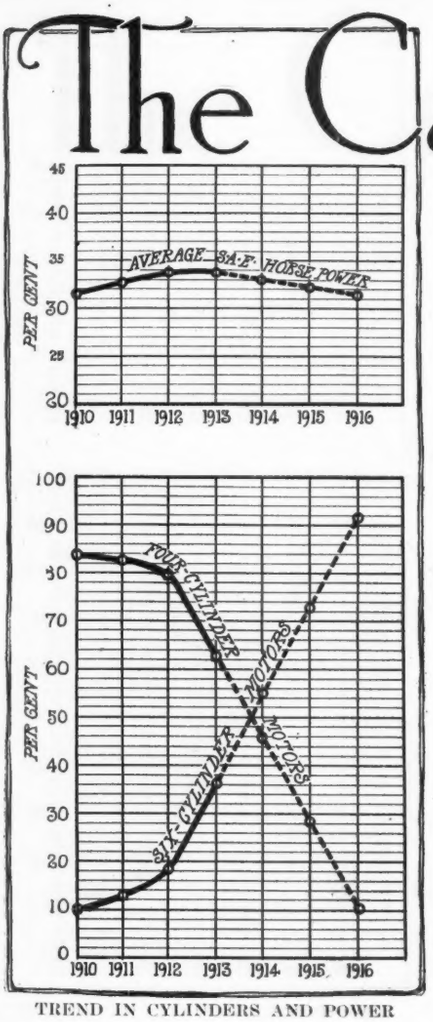
Development Logical

The majority of designs offered for 1913 are quite logical in the consistent development and refinement along the lines pointed out by past experience. This will be hailed with acclaim by a large class of motorists, meaning as it does the standardization of motor car design, the lessening of depreciation, and the ability to run a car 2 or 3 years without fear of being classed as a second-hand buyer. Others, however, insurgents against the established order of orthodox design, will approve the fearless efforts of the younger set in motor car production to introduce into the motor car business the progressiveness that is characteristic of American manufacture.

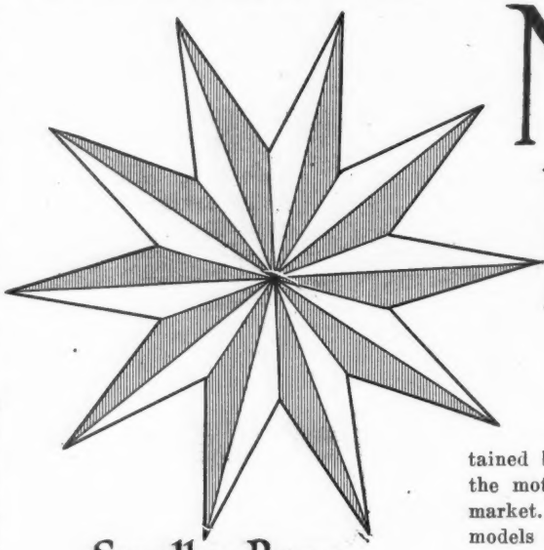


MOVEMENT OF STEERING WHEEL AND CONTROL LEVER FROM THE RIGHT SIDE TO THE LEFT AS INDICATED BY PER CENT OF LEFT-HAND OPERATION

The Cardinal Points in Motor Design



TREND IN CYLINDERS AND POWER



Smaller Bores
Longer Strokes
Six Cylinders
Block Castings
Chain Camshaft Drive
Worm Camshaft Drive
Spiral Gear Camshaft Drive
Less Horsepower
Pressure Oiling
Heated Intake

THIS year is a notable one on account of the new designs in motors which have been brought out. Not that there has been the radical changes in principles of operation which last year resulted in the adoption of non-poppet valve motors by so many firms, but that the standard features have undergone a redesigning and rearrangement in very many instances which make for easier maintenance, increased accessibility, longer life and a more complete use of every particle of energy in the fuel. The paramount features of this year's developments are the great increase in the length of the stroke as compared with the bore of the cylinder, the influx of six-cylinder motors, the increased popularity of block cylinder castings and larger valve and port areas.

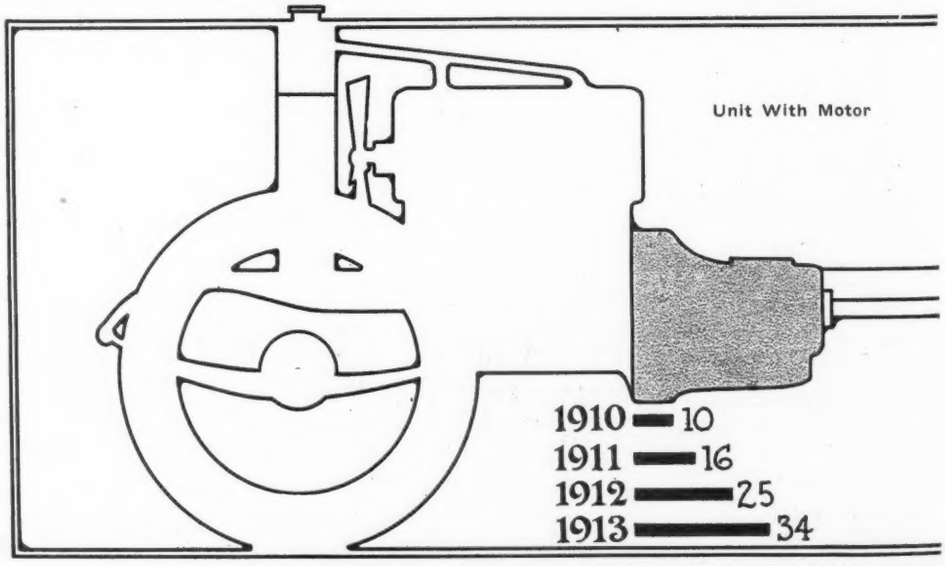
Long Stroke More in Evidence

Last year's tendencies toward a smaller bore diameter and longer piston stroke is evident in greater force this year. The average cylinder diameter of over 300 different motors on the market for 1913 is only 4.19 inches, considerably over ⅛ inch less than the cylinder bore of the average motor in 1912. Even more pronounced than the decreased bore is the increase in stroke of the 1913 motor, whose average this year is 5.15 inches as against 4.97 inches in 1912.

There is not an iota of guesswork in the averages for bore and stroke and other dimensions of cars and motors, for these averages are the actual figures obtained by careful calculation from all of the motors and cars upon the American market. Of the 339 different chassis models offered to the buying public for this year, there are approximately 300 different motors and the averages given are the averages of all of them.

Average Horsepower, 33.6

This decrease in cylinder bore and increase in length of stroke has altered the ratio of stroke to bore very appreciably since last year. The 1912 stroke was 1.15 times as great as the bore, while this year it is 1.23 times as great as the bore or nearly one-fourth greater stroke than bore. What may at first sight seem a paradox in figures is that in spite of the smaller bore for the 1913 motor the horsepower as rated by the S. A. E. formula remains just the same as it did last year, and inasmuch as the S. A. E. horsepower of the motor varies in proportion to the square of the bore we would expect a very decided drop in this figure. The fact that the rated horsepower remains at 33.6, the same figure which held last year,



PERCENTAGE OF CARS FOR 4 YEARS WITH TRANSMISSION GEARS

can be explained by the increased number of six-cylinder motors on the market. Had there been no greater proportion of sixes this year than last, the rated horsepower would have dropped to 31.4 with the decrease in average bore, but the proportion of sixes over fours has increased sufficiently to hold the average horsepower up to its former point. In spite of this fact, the horsepower of these motors would show on a brake test a very decided increase over those of the 1912 vintage, for, not only has there been the greater increase in length of piston stroke over 1912 but valve diameters, valve lifts and port areas have been increased as a result of the increase in stroke so that the gas is introduced into the cylinder with less wiredrawing and is let out with less back pressure and more quickly, resulting in an increase of fuel efficiency. At the same time the lengthened stroke increases somewhat the piston displacement of the cylinder so that more gas is drawn in and the power thereby increased.

Motors More Efficient

The effect of this change in the design upon the power actually delivered by a motor can be no better illustrated than in the case of the new Simplex six-cylinder motor which has cylinder dimensions the same as those of the 50-horsepower Simplex but valves of the same size as those in the 90-horsepower. This simple expedient of using a much larger valve has resulted in an increase of power sufficient that the same size of motor which the makers formerly rated at 50-horsepower is, with the larger valve, rated at 75.

One of the chief movements of the year has been towards silencing the camshaft drive. This is in line with the steps taken last year when enclosed valves became almost universal. To further silence the operation of the motor, makers have resorted to the use of other than the plain spur gears for the operation of the valve camshafts, pumpshaft, magneto, and so on. This is accomplished in one of two ways, either by substituting silent chain timing drive for the gears or by using the helical, spiral or herringbone teeth on the timing gear. Among the first to adopt silent chains are Correja, Hupmobile, Schacht, Kisselkar, Rayfield, Stoddard-Dayton, Stearns, Velie, Atlas, Cadillac, Columbia, Edwards and Oakland. There are twenty makers who have adopted the helical or spiral method of cutting the teeth of the camshaft timing gears. The list includes such names as Haynes, Garford, Lozier, Mitchell, Palmer-Singer, Premier, Cole, Speedwell, Stevens-Duryea and Studebaker.

Starting Made Easier

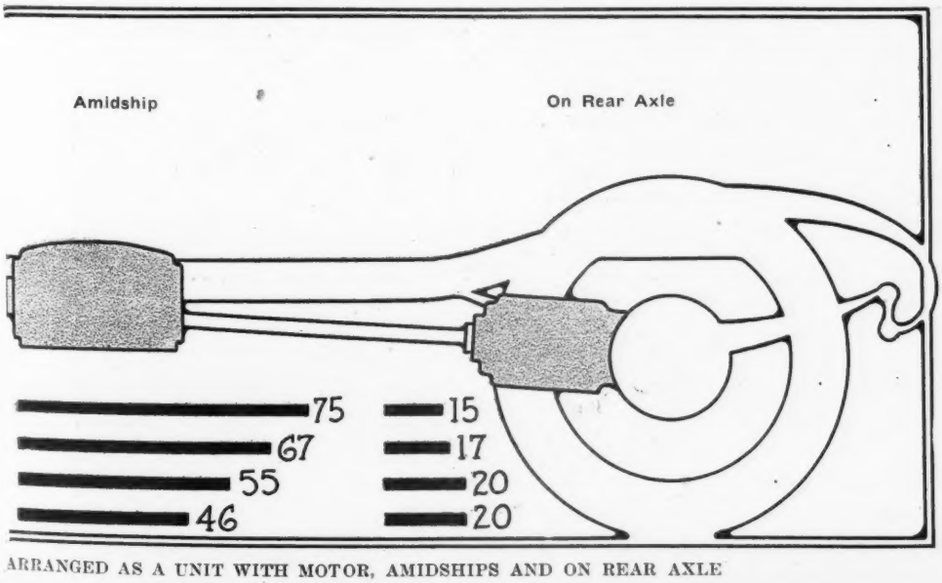
Methods for insuring a better mixture and easier starting, particularly in cold weather, are more in evidence this year than ever before. One of the most radical changes which has come into favor for accomplishing this purpose is to install the carbureter upon the side of the cylinder farthest from the intake valve and to lead the intake pipe through the cylinder casting between the cylinders to the manifold. This arrangement permits the intake gases to be heated by their passage through the motor where they are completely surrounded by hot water in the cylinder jacket and results in a more intimate mixture of the fuel and air and thus in an increased efficiency. Among the cars employing this method of heating the intake gases are the new Studebaker models, Hupmobile, R. C. H., Detroiter and White.

Another tendency in motor design which is making its appearance this year is illustrated in the new Studebaker models and in the Velie. This is the location of the magneto at one end of the motor instead of at the side, as is the usual practice, and driving it by a transverse magneto shaft which is operated by the camshaft by means of bevel or worm gear. This arrangement in some instance makes for accessibility and for cleaner looking motor. Fiat and Mitchell also employ this.

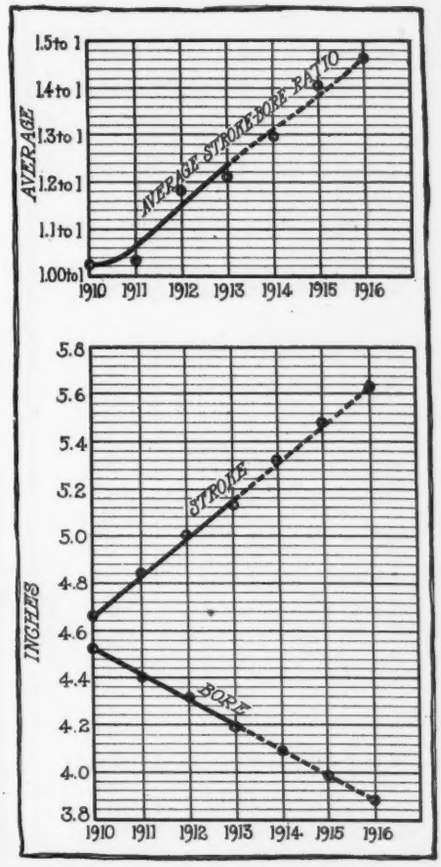
Along with the movement toward greater accessibility of motor parts there has been another which might at first glance seem to be diametrically opposite of this. That is, the tendency toward making the motor more compact, to decrease its overall dimensions and weight without sacrificing anything in the matter of piston displacement. However, this can be accomplished without losing the necessary feature of accessibility by care in designing and placing of the various units that go to make up the complete motor. This has been accomplished within the past 12 months in the Stevens-Duryea motor which always has been noted for the amount of space it took up under the hood. This year the motor has been redesigned so that without decreasing the bore or stroke the motor has been made very much more compact. At the same time the element of accessibility has not been oerlooked in the new cars.

Starters Affect Design

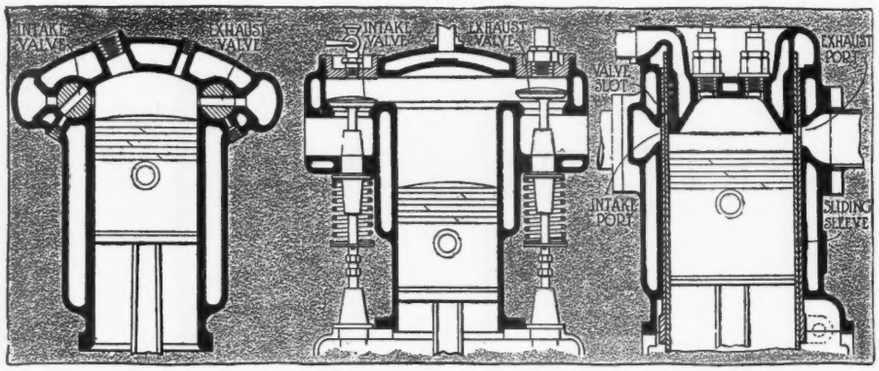
In conjunction with the landslide to motor starters there has been a corresponding rush to other arrangements which make starting easier whether it be done by hand or by a starter proper. The very fact that engine starters are being employed so widely has brought about the use of arrangements which make hand-starting easier. This seeming paradox can be accounted for by the fact that motorists who are fortunate enough to have cars equipped with starters have learned to husband their supply of starting energy, since



ARRANGED AS A UNIT WITH MOTOR, AMIDSHIPS AND ON REAR AXLE



TREND IN BORE AND STROKE



THE THREE TYPES OF FOUR-CYCLE MOTORS ON THE AMERICAN MARKET
MEAD ROTARY VALVE ORDINARY POPPET-VALVE KNIGHT SLEEVE-VALVE

with these any excessive spinning of the engine results in a very noticeable depletion of the supply; whereas in the case of hand starting the motorist is usually prone to consider his supply of human energy practically inexhaustible. Also, makers of non-starting cars have attempted to achieve in a measure some of the benefits of self-starting motors by adding ignition and carbureter features which make the labor of hand cranking as light as may be.

Both carbureter and ignition apparatus makers have come to the aid of the motor maker in his effort to make starting easier. Some of the carburetion arrangements which are gaining in popularity are the shut-off valve for the main air intake which can be operated from the dash, spray nozzle adjustments and ticklers for flooding the carbureter, both of which can be worked without the driver leaving his seat, and small tanks of gasoline on the dash by which the motor actually can be primed from the seat by injecting gasoline directly into the cylinders. An arrangement of this sort is used in connection with the dash fuel tank of the Hupmobile.

Starting Made Easier

Ignition devices for increasing the ease of motor starting are gaining in favor and include special dual system by which a spark can be sent into the cylinder in firing position by the pressure of a starting button to give a start on the spark; special plugs and special coils which can be employed for converting the single ignition system into the dual and thus give the battery starting with its advantages. advantages.

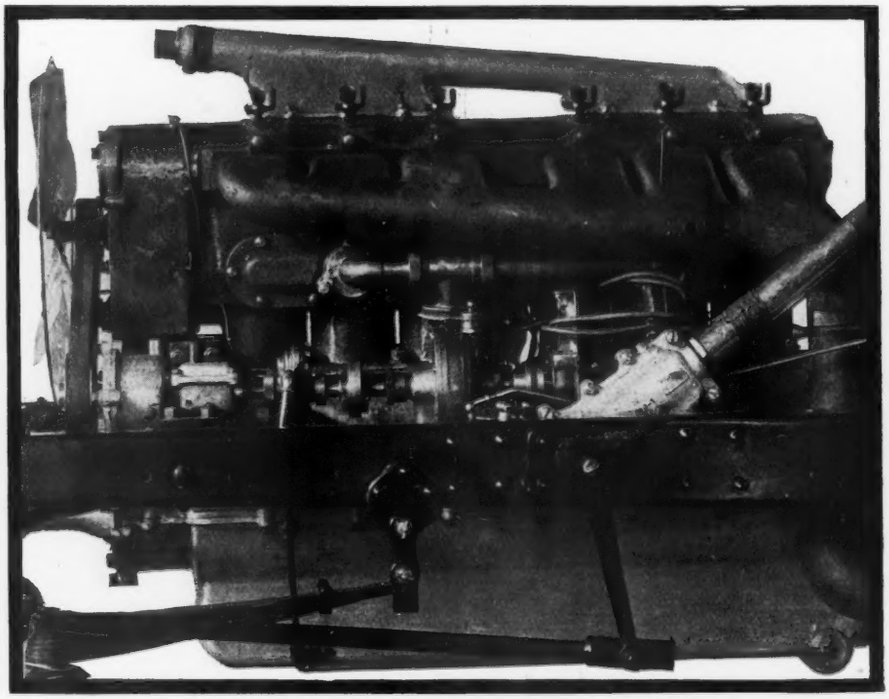
The increase in the bore-stroke ratio is very pronounced during the past year. This is accomplished not only through the lengthening of the stroke but also to a less extent by the decrease in the bore. In fact, the average figures for 1913 motors give a bore of 4.19, while that of 1912 was 4.34. This comes with an increase in the stroke of .18 inch over last year's average. The two factors result in the increase of the bore-stroke ratio from the 1.13 to 1 of 1912 to 1.33 to 1 of this year. The figures just given are only the averages, but there are many specific cases in which the difference between the bore and stroke is vastly greater. In the list of cars, arranged according to their bore-stroke ratio, on another page, will be found several with a very much longer stroke than bore. The Only car heads the list this year, as last, with a bore of 4¼ by 7⅞ stroke, giving it the extreme stroke-bore ratio of 1.86 to 1. The Hupmobile is second with its 3¼ by 5½ inch cylinder, giving it a ratio of 1.69 to 1. There is fully 30 per cent more motors with a ratio greater than 1 than there were last year and the list of the square motors and those with bore greater than the stroke is consequently decreased. There are only five motors this year whose bores are greater than the stroke. These are the Cameron, four and six, the Little Four, the five-cylinder revolving Adams-Farwell motor and the two-cylinder Gleason. And there are only twelve square motors.

In the matter of lubrication of the motor there has been a very decided growth toward the feeding of oil under pressure through drilled crankshafts. This is accomplished either with or without the accompaniment of the splash lubrication to the other bearings of the motor than the crankshaft bearings. In some instances the wrist pin and even the cylinder wall itself is lubricated by pressure through tubes along the connecting rod, as is done in the Marmon. Pure pressure oiling, that is, where the entire lubrication of the motor is taken care of by pressure, shows a gain of 4 per cent over last year, 14 per cent of the chassis employing it this year, while only 10 used this method in 1912. The combination of splash and pressure likewise shows a gain over last year's figures of 32 per cent for nearly one-third of the cars employ this method this year, whereas only one-fifth of them used a combination of splash and pressure last year. Pure splash oiling shows a proportionate decrease.

Lubrication Developments

Circulating systems of lubrication are found on about 85 per cent of the motors this year. The remainder is divided equally between the mechanical, vacuum and gravity feed systems and those in which the oil is mixed with the fuel, as in the two-cycle motor. All three of these classes are noncirculating. Circulating oiling systems are those in which the oil supply is used over and over again. Noncirculating system is one in which the oil is fed to the bearings at about the correct rate and does not return to the source of supply and therefore can be used but once.

Motors having drilled crankshafts through which oil is conducted to connecting rod bearings include the White, Marmon, Stutz and Alco. In the Knox and Oldsmobile, in place of drilling the connecting rods, tubes are secured to the connecting rods and oil is conducted through them



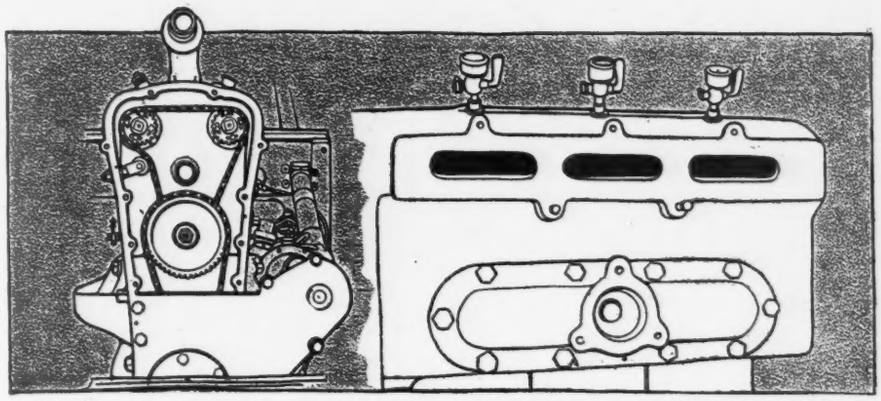
EXHAUST SIDE OF MEAD ROTARY-VALVE MOTOR AS USED BY SPEEDWELL

from the lower to the upper piston pin bearings. In all of these there are leads to each of the main crankshaft bearings. About 20 per cent of the motors this year using circulating oiling systems have either internal or external leads conducting lubricant to the main bearings of the crankshaft, and some have leads that carry the oil to the timing gears, crankshaft bearings, etc., while the Mitchell goes still further and has an oil lead to the clutch collar.

Four Valve Types

Four distinct principles of operation are involved in the motor types as employed in 1913. These are the ordinary poppet-valve, which still is almost universal, the Knight sleeve-valve, appearing in five different cars at present, with the promise of an early appearance in a sixth, the rotary-valve motor, which has made its debut as the first in America in the Speedwell, and the two-cycle motor. The first three mentioned are of the four-cycle type, while the two-cycle motor is losing in favor, all of its former adherents in the pleasure car field except Duryea having abandoned it.

The three four-cycle types of motor on the American market are shown together in cross section on these pages for the purposes of comparison. The ordinary poppet-valve motor is too familiar to need description, but the two non-poppet motors, the Knight sleeve-valve and the Mead rotary-valve, are worthy of elaboration. So far as the action within the cylinder is concerned they are the same as the poppet-valve motor. Non-poppet motors vary among themselves and from the older poppet type only in the method of introducing the gas into and expelling it from the cylinders.



END AND SIDE VIEWS OF MEAD ROTARY-VALVE MOTOR SHOWING CHAIN-DRIVE TO VALVES, AT LEFT, AND INTAKE OPENINGS, RIGHT

In the Knight sleeve-valve motor the top of each cylinder has two horizontal slots, one of which is in connection with the inlet manifold and the other with the exhaust manifold. Inside of the cylinder and between it and the piston are two thin hollow cast-iron cylinders or sleeves, arranged to be moved up and down by cranks or eccentrics operated from the crankshaft of the motor. Large horizontal slots in these sleeves are made to register with each other and with the openings in the cylinder wall at the proper times as the sleeves move up and down independently of each other.

Knight Motors

Both sleeves move at the same speed but not together; one may be going up while the other is coming down. At certain times in this movement the opening in the cylinder wall and the two openings in the sleeves will coincide, giving a passage from the manifold to the interior of the cylinder. It is at these times that exhaust and inlet take place. The travel of the sleeves is comparatively small, their speed being but one-tenth that of the piston. The movement is such that the ports in the cylinders are closed by at least one of the sleeves during three-quarters of the time and are open the rest of the time by the lining up of the openings in both sleeves with that in the cylinder. Silence at high speeds, greater flexibility, and less loss of compression are the advantages claimed for the sleeve-valve motor.

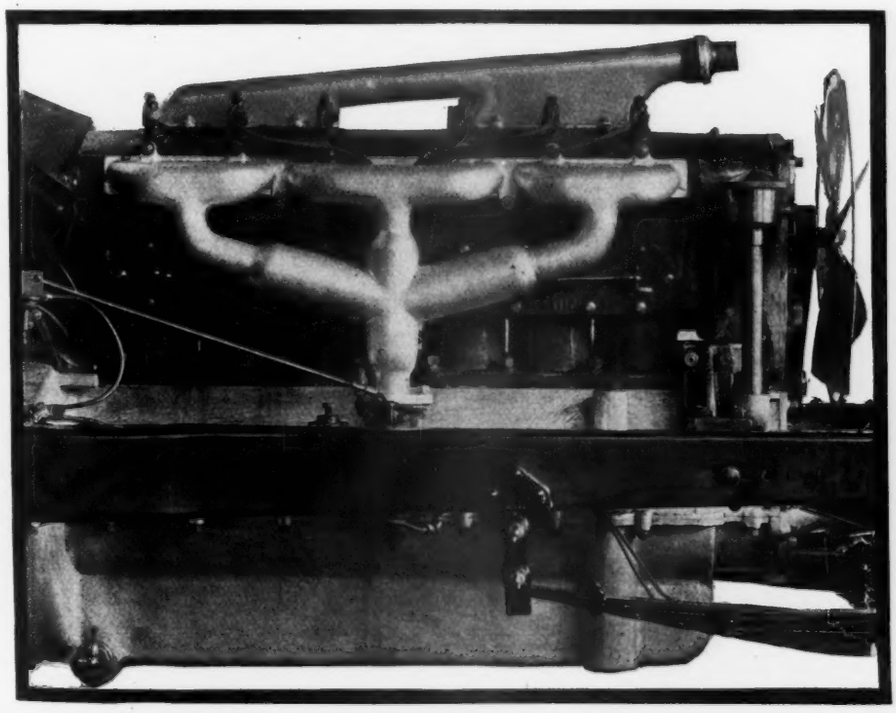
New Rotary Valve

The four-cycle rotary-valve Mead motor, the characteristic of a new Speedwell product for 1913, has six cylinders cast in blocks of three. Instead of the valves being of the mushroom type, as in the case of the poppet motor, they are in the form of ports in the shape of slots cut out of a cylindrical bar of steel 1½ inches in diameter. These ports are 2¼ inches long and have rounded ends.

There are two valve-containing rods, one for the intake and the other for the exhaust valves and these are on opposite sides of the motor. The front ends of these rotary valve rods have sprockets attached, a silent chain attached to the geared crankshaft operating both valves. The valves are made in two parts end to end, each half extending through the top of the cylinder casting the length of three cylinders. The two parts are coupled by means of a universal joint.

A cross section of one of the cylinders shows the location of the valve ports and the extensive water jacket space. In operation, these valves revolve at one-quarter crankshaft speed and since the lubricant is mixed with the fuel, valve lubrication is taken care of. However, the lubrication is supplemented by splash from the crankcase reservoir. To prevent the valves from sticking to the cylinder proper, for no other bearing is provided, the valves are annealed four times before being put into service.

The film of oil deposited on the valves by means of the oil in the fuel is a means of maintaining compression when needed. The cylinders have 4⅛ inch bore and 5¼ inch stroke, making the motor's piston displacement 420.9 cubic inches.



INTAKE SIDE OF SPEEDWELL-MEAD SIX-CYLINDER MOTOR

Six-Cylinder Shows

PROBABLY the greatest advancement of the year is in the vast increase in popularity of the six-cylinder car. The number of six-cylinder motors has increased by leaps and bounds until now the 1913 field offers 112 different motors of six cylinders, whereas there were only 53 six-cylinder motors on the market last year. This is over 100 per cent increase over the 1912 number of sixes. These six-cylinder cars are the offering of 77 makers, 40 of whom have entered the six-cylinder field for the first time. Many of the makers who have built sixes previously have designed new ones which have been added to their list. Last year there were 48 makers of six-cylinder cars, an increase for 1913 of 38 per cent. One former maker of six-cylinder cars has withdrawn from the industry entirely. This is the Thomas, while the plans of the Berkshire and Sebring for 1913 are not yet decided upon, and the two Flanders take the place of the Everitt, and Touraine replaces the Nance.

New Makers Six Enthusiasts

Many makers who appear in the six-cylinder ranks for the first time this year have entered with both feet, offering two and three different sizes of motors. Among these are the A. E. C., Burg, Crow-Elkhart. Some of the older makers have added new models or have redesigned the older types of motors. In almost every instance the new motors are of smaller bore or longer stroke, or both, than the older motors which they replace. For instance, the Garford six is an entirely new design and among other changes shows a reduction of bore and increase of stroke. The 1913 motor has cylinders 3¾ by 6 inches, while the older motors had 4¼ bore and 5¼ stroke. The Lozier new six is 4¼ by 5¼, replacing 4⅝ by 5½ inches bore and stroke. The McFarlan six retains its bore at 4 inches, but the stroke has been increased from 5 inches to 6 inches. The Peerless has a new six of 4 by 5½ inches bore and stroke. This tendency towards increasing the ratio of the stroke to the bore is as noticeable in the six-cylinder field as in the four-cylinder field; in fact, there will be found a greater percentage of the sixes among the long-stroke motors than there is among those in which the stroke is less or no greater than the bore. For instance, the third highest motor in the point of ratio between stroke and bore is the six-cylinder Mitchell, with cylinders 4¼ by 7 inches in size, giving it a stroke-bore ratio of 1.65 to 1. The sixth, seventh, eighth, ninth and tenth motors in the order of bore-stroke ratio likewise are sixes. These are Nyberg, Mitchell and Garford, each with 3¾ by 6-inch cylinder, giving them a stroke-bore ratio of 1.60 to 1, Rayfield with 1.76 to 1, Austin with 1.66 to 1 and Correja with 1.54 to 1.

New Sixes in Old Lines

In fact, the lengthening of the stroke seems to go hand in hand with the increase in popularity of the six-cylinder motor.

Probably this wide-spread tendency toward the long-stroke motor can no better be emphasized than by mentioning some of the old, more conservative makers who have re-designed their motors for the new year on the basis of diminished bore and greater stroke. Among these are the Packard, with its new 38, of 4 inches bore and 5½ inches stroke; Stearns, with a new Knight model of increased stroke; Pope-Hartford with a motor of smaller bore while the stroke remains the same; and the Glide and Garford as well. The Oldsmobile new model is a long-stroke type incorporating an L-head motor in a unit power plant.

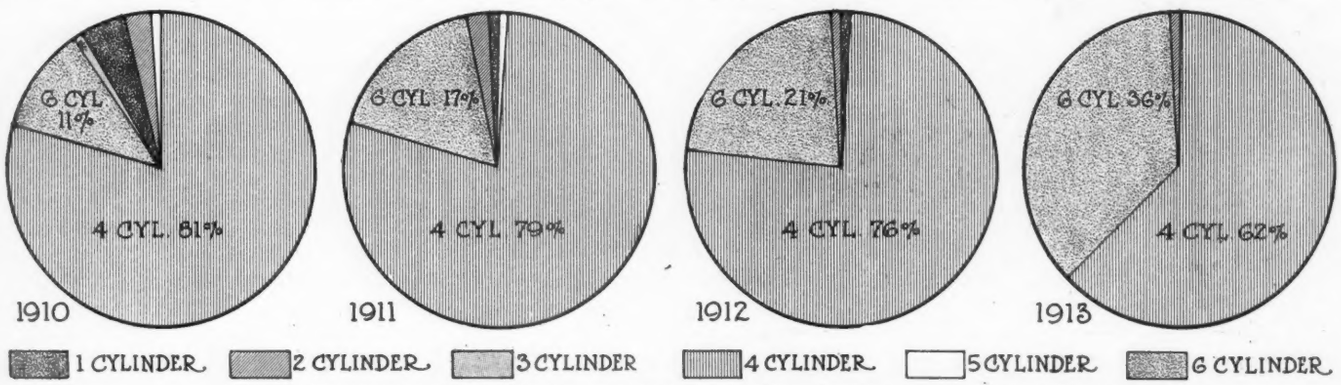
There is no better way to show the enormous growth in popularity of the six-cylinder motor, as compared with the four, than by means of a diagram. One of the charts on pages 8 and 9 graphically shows the rise of the six and the fall of the four in popular estimation during the past 4 years. The line labeled six-cylinder motors is drawn through points representing the percentage of chassis with six-cylinder motors in 1910, 1911, 1912 and 1913, respectively, and the line marked four-cylinder motors similarly represents the percentage of fours for these years. It will be noticed that in 1910 only 10 per cent of the chassis models on the market had six-cylinder power plants. This increased to 13 per cent in 1911, 19 in 1912, and then took a sudden jump to 36 per cent this year, almost doubling in the past 12 months. If the present rate of increase in the demand for sixes continues for another year, 1914 will see more sixes in the field than fours. This is graphically shown in the diagram, the curves for past years being produced as dotted lines for 3 years in the future.

It is to be expected that the percentages of fours will fall off in proportion to the rise in the sixes, and the curve shows that this is the case. However, it hardly would be fair to assume that there would be no fours 4 years hence, as the curve seems to indicate, for it is probable that the demand for the fewer number of cylinders will always be present among buyers of the cheaper cars, and the curve will therefore commence to approach the horizontal, indicating a constant demand.

Six Cylinders Cheaper

So far as the prices of the six-cylinder cars are concerned, it has been the subject of frequent comment that sixes have been selling at a lower price this year. Up to this time there has been a decided, though gradual rise in the list price of sixes, but the average price of all the six-cylinder cars on the market for 1913 is lower than it ever has been. This is indicated in the comparative price chart on these pages.

Cylinder designs have undergone the



HOW THE SIX-CYLINDER MOTOR IS CROWDING OUT ENGINES OF FEWER CYLINDERS

100 Per Cent Increase in Popularity

same gradual change during the past 12 months as has been indicated by the tendencies during the preceding 2 years. Both the T-head cylinder and the L-head cylinder have been about stationary, the slight increase of 1 per cent in each case over last year's figures being due simply to a drop in the number of two-cycle cars on the market. With the loss to this category of the Amplex, the Atlas and Elmore, this year has been an unfortunate one from the two-cycle point of view as this leaves Duryea the only exponent of this type of car for 1913. The Knight type of sleeve-valve engine has not made the great stride during the past year that was hoped for by its advocates a year ago, but there has been a gain of 1 per cent in the number of chassis employing it for 1913, accounted for by the appearance of the new Edwards-Knight and the new six-cylinder Knight engine of the Stearns line. This is the same as the Stearns-Knight four-cylinder cars as to bore, 4½ inches, while the stroke has been lengthened ¼ inch over that of the fours, making it 5¾ inches. In design the new six adheres closely to the principles worked out for the fours.

Cylinder Shapes Discussed

Although the percentage of cars employing the T-head, L-head and straight cylinders has remained about the same as last year, there has been considerable interchange, particularly among the sixes as to the different cylinder shapes. The Norwalk six, for instance, is using the T-head motor for this year instead of the valve-in-the-head type employed heretofore. The new Amplex motor, which is the first Amplex of the four-cycle type, is of the L-head type with both valves on the right side. The new Auburn six has both intake and exhaust valves on the left side. The new Chevrolet six is interesting as it incorporates the ideas of a former racing driver, and is one of the few new models with valves on opposite sides.

The Correja has added a new six-cylinder model of the T-head type, as has the Crow-Elkhart. The two new Flanders sixes, which are an outgrowth of last year's Everitt, are of the L-head type, as is the new Garford six. The Havers, which, like the Premier, appears only as a six, has both valves on the same side, while the Herreshoff, said to be the smallest six in America, has a motor of the T-head type, unusual in cars of such small size. The Hudson six, which is cast in two blocks of three cylinders each, is of the L-head type, as is the monoblock Interstate six.

There are few in the ranks of the straight cylinder type with valve in the head, but these include the Cameron, Chalmers, Franklin, Knox, Matheson and Pope-Hartford. Some makers have refused to put their eggs all in one basket and have produced six-cylinder motors of different types; for instance, the A. E. C., Austin, Lozier, Packard and others offer sixes with both the T-head and L-head construction, while the McFarlan has sixes of both the T-head and straight type.

Block-Cast Sixes

Monoblock casting of the cylinders has increased very much in popularity, 29 per cent of the motors now having their cylinders an integral casting, whereas only 18 per cent were so molded last year. This is particularly noticeable in the six-cylinder field where the two added cylinders make the problem of block casting with proper bearing supports for the crankshaft a more difficult problem. However, there are several makers of sixes who have taken up block casting for the first time this year and in practically every case these new motors have a very decided tendency toward the long stroke. Among these are the Garford six motor, which is a monoblock casting with cylinders 3¾ by 6 inches bore and stroke, giving it a ratio of 1.6 to 1. With it is also incorporated for the first time the clutch and gearset in unit power-plant construction. The Interstate is another example of six-cylinder monoblock construction, as is also the new Little Six, the Herreshoff, the two Flanders sixes and several others. Along with the increased popularity of block casting of sixes there has been a similar growth of the popularity of the method of casting the cylinders of the six in two blocks of three each. Two new examples are the Lozier and Norwalk.

In spite of the popularity of the block casting of sixes, it will be found that at least one-half of the sixes are cast in pairs, perhaps 20 per cent cast separately, a like proportion in block and the remainder cast in threes.

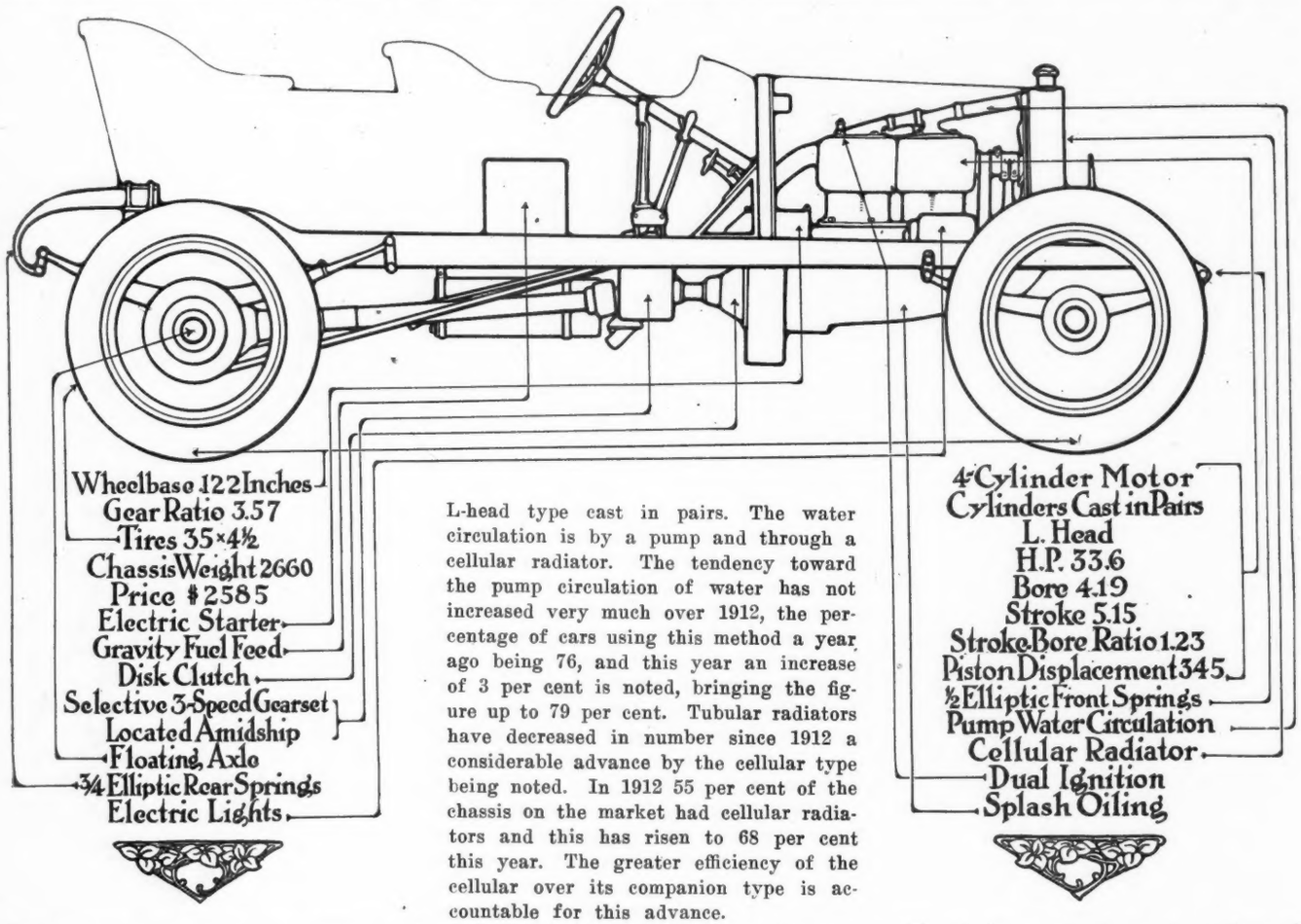
Fewer Bearings the Rule

There is a notable tendency in all new motors, particularly the sixes, to reduce the number and increase the size of the crankshaft bearings. The Lozier, for instance, has two plain bearings replacing the four ball bearings and seven plain bearings employed in its earlier models. The Garford block-casting six has but three bearings. The camshaft bearings are made of larger diameter so that the shafts can be removed through the bearings endwise. Hollow crankshafts are coming into vogue and are found this year on the new Edwards-Knight, Locomobile and Garford. The reason for the use of hollow crankshafts is a logical one in that by this means the shafts are made very much lighter without sacrificing strength and rigidity; also the crankshafts can be made larger in diameter without making them too heavy so as to give very great increase in bearing surface. In the Garford this idea is carried still further by crank arms curved instead of the conventional straight form.

There has been a very decided movement toward unit power-plant construction of six-cylinder cars this year, by far the greater proportion of the new sixes on the market have motor, clutch and gearset as a single unit. Accompanying this is the method of suspending the unit power plant upon three points. Three of the motors in which this is employed for the first time are the McFarlan and Herreshoff and Stearns.

ILLUSTRATING THE CHANGES IN PRICE OF THE SIX-CYLINDER CAR DURING 4 YEARS

Composite American Car of 1913



THE composite car is the average of all the cars on the market for 1913 and embodies the features of all these cars and with its longer stroke and shorter bore, it is in good contrast to the 1912 average product. Not only as regards the bore and stroke does the average or composite American car differ from the sifting of the 1912 output, but in many other respects. The bore of the average 1913 car is 4.19 inches, a considerable decrease from the 1912 figure—4.34 inches. The stroke, on the other hand, has increased from 4.97 inches in 1912 to 5.15 inches in 1913.

Grand Average Car

That the S. A. E. horsepower rating remains the same, 33.6, does not indicate that the motor is of the same actual power, for the piston displacement has been increased considerably this year. The 1912 figure showed that the average piston displacement was 316.2 cubic inches as against 345.0 cubic inches this year. This long-stroke motor developing more actual power than the average motor of 1912 is much more flexible and quieter than its predecessor.

The resultant of all the 1913 cars has a four-cylinder motor, with cylinders of the L-head type cast in pairs. The water circulation is by a pump and through a cellular radiator. The tendency toward the pump circulation of water has not increased very much over 1912, the percentage of cars using this method a year ago being 76, and this year an increase of 3 per cent is noted, bringing the figure up to 79 per cent. Tubular radiators have decreased in number since 1912 a considerable advance by the cellular type being noted. In 1912 55 per cent of the chassis on the market had cellular radiators and this has risen to 68 per cent this year. The greater efficiency of the cellular over its companion type is accountable for this advance.

Besides having these various characteristics, the 1913 composite car has a splash system of motor lubrication. Dual ignition is another desirable feature of this motor, this system having made an increase of 5 per cent over the 1912 percentage. A year ago 63 per cent of the cars on the American market were equipped with dual ignition and this year sees this rise to 68 per cent. The motor is fed by gravity. The running gear of the average car on the market this year embraces a disk clutch, three-speed selective gearset located amidships. The drive is through a shaft to bevel gears to a floating rear axle. The gear ratio is 3.57 to 1, a slight decrease in respect to the 1912 ratio which was 3.62 to 1. Due to the greater percentage of sixes on the market this year the average weight has increased to 2,660 as against 2,290 in 1912. This increase in weight is of course accompanied by an increase in tire size.

Motor Starters the Rule

In 1912 the average car had 35x4 tires and 1913 sees 35x4½ as the average tire size. Starting the motor by electricity seems to be in favor, since 37 per cent of the cars on the 1913 market are so equipped, while the acetylene starter follows with 14 per cent. A great number of cars, 31 per cent to be exact are not equipped with starters, perhaps due to the fact that experimenting in this direction has not resulted favorably. The demountable wheel has taken a firm grip on the buying public for its demands have resulted in a 400 per cent increase in this feature since 1912. A slight advance in price is noted this year, but taking into consideration the added equipment, the average car may be said to be cheaper. In 1912 the average car sold for $2,508, while this year it is shown as costing $2,585.

Average $1,000 Car

The average car in the $1,000 class has a four-cylinder L-head motor cast in block, with a bore of 3.75 inches and a stroke of 4.32 inches. This does not show a very decided variance from the 1912 figures, which were 3.78 inches bore and 4.37 inches stroke. This is the only class that shows a drop in the piston displacement and, although this has not been great, it shows the tendencies of the manufacturer in this class. In 1912 the average piston displacement of the cars in this class was 186.2 cubic inches and this year a decrease of 4 per

Average Price, $2585—Average H.P. 33.6

cent is noted bringing the piston displacement of the 1913 $1,000 car down to 178.0 cubic inches.

The average horsepower for 1912 was 21.18 while the 1913 result shows an average of 21.80 horsepower in this, the $1,000 class. The wheelbase and tire size has remained practically constant since 1912. The gear-driven camshaft claims the admiration of 87 per cent of manufacturers. In respect to motor cooling this class is an advocate of foreign practice and the fact that 52 per cent of the cars in the $1,000 class have thermo-syphon cooling of the cylinders, an increase of 4 per cent over 1912. This, too, is the only class that adheres to the tubular radiator, 79 per cent of the cars in the $1,000 class using this method of radiation.

This class shows its belief in foreign practice when, for 1913, 43 per cent of the cars are using single ignition, an increase of 5 per cent over that of 1912. However, the dual system claims the greater number of admirers in this class but shows a marked decrease since 1912. While 30 per cent of the $1,000 output is equipped with an engine starter, it must be remembered that a car costing less than $1,250 is not expected to be equipped with such a luxury if chassis and body refinements are to be looked for. The outlook is promising, however, for this class did not boast of starters in 1912.

A year ago only 38 per cent of the cars in the $1,000 division could boast of a disk clutch, while 1913 brings the total to 49 per cent. A three-speed selective gearset characteristic of this class is part of the unit power plant. Shaft through bevel gear drive and the semi-floating rear axle are part of the running gear specifications.

Average $1,500 Car

Cars of the $1,500 class have four-cylinder motors of the L-head type and cast in block. The bore of the $1,500 car is 4.18 inches, a slight drop from the 1912 average bore in this class—4.26 inches. The stroke this year is 5.05 inches. With the decrease in bore has come a decrease in the horsepower from 30.01 in 1912 to 28.9 this year. The tire size of this class has remained the same for the past 3 years and this year sees no change, the tire size being 34x4.

With the 7 per cent increase in the number of six-cylinder chassis in this class the average wheelbase has increased from 116 inches in 1912 to 119 in 1913. The advance in price of the average $1,500 car from $1,595 to $1,662 was to be expected on account of the increased equipment.

Manufacturers are divided as to the merits of the piston pump and gear pump for lubricating purposes, 42 per cent of the chassis in the $1,500 class using the piston pump while 45 per cent use the gear pump. The dual ignition system ranks first in choice as a means of ignition for 78 per cent of the chassis in this class use this form as against 75 per cent in 1912. The gravity fuel feed is losing its firm grip as is shown by the decrease of 9 per cent from the 1912 figure, 81 per cent of the chassis on the market in this class having gravity fuel feed while 90 per cent was in favor of it in 1912.

The unit power plant is uppermost in the $1,500 group, 43 per cent of the chassis in this class having this feature. The three-speed selective gearset is more in evidence than any other form. Right-hand drive and right control has the greatest number of followers, though left-hand drive has made heavy gains.

Composite $2,500 Car

The $2,500 class, working in unison with the others, favors the long stroke and short bore, the figures being 5.27 and 4.23 inches respectively. With the influx of sixes the piston displacement has risen from 336.5 to 372 cubic inches and the average horsepower advanced to 35.9. The

COMPARISON OF THE AVERAGE AMERICAN CAR FOR 4 YEARS

GENERAL AVERAGES	1913	1912	1911	1910
Horsepower	33.60	33.60	32.7	31.5
Bore	4.19	4.34	4.42	4.85
Stroke	5.15	4.97	4.46	4.68
Stroke-bore ratio	1.23–1	1.15–1	1.35–1	1.21–1
Piston displacement	345	316.2	313.2	281.5
Wheelbase	122	121	114	112
Gear ratio	3.57	3.62	.....	.....
Tires	35x4½	35x4	34x4	34x4
Chassis weight	2,660	2,290	.....	.....
Number chassis	339	381	393	364
Number makes	156	193	270	239
Price	$2,585	$2,508	$2,560	$2,214
PERCENTAGE				
One cylinder	0	1	1	5
Two cylinders	1	1	2	3
Four cylinders	62	78	80	82
Five cylinders	1	1	0	0
Six cylinders	36	19	17	10
T cylinder type	31	30	22	20
L cylinder type	56	55	60	56
I cylinder type	9	9	14	18
Knight type	3	2	1	0
Two-cycle	1	4	3	6
Cylinders cast separate	15	22	28	39
Cylinders cast pairs	48	58	60	53
Cylinders cast en bloc	29	18	12	8
Cylinders cast threes	8	2	0	0
Air-cooled	4	5	6	7
Thermo-syphon	17	19	28	23
Pump circulating	79	76	66	70
Tubular radiator	32	44	59	72
Cellular radiator	68	55	41	28
Single ignition	15	14	18	25
Dual ignition	68	63	53	40
Dual double ignition	2	0	0	0
Double ignition	15	23	29	35
Splash oiling	53	68	81	0
Splash-pressure oiling	32	20	0	0
Oil in fuel	1	2	3	6
Pressure oiling	14	10	19	0
Electric starter	37	2	0	0
Acetylene starter	14	0	0	0
Lever starter	1	0	0	0
Spring starter	3	0	0	0
Air starter	9	2	1	1
Optional starter	5	0	0	0
None	31	98	99	99
Gravity fuel feed	65	0	81	82
Pressure fuel feed	35	0	19	18
Disk clutch	52	44	51	49
Cone clutch	45	52	47	39
Expanding band clutch	1	3	2	6
Contracting band clutch	2	1	1	3
Selective gearset	94	92	90	85
Progressive gearset	2	5	1	8
Planetary gearset	1	2	4	4
Friction gearset	3	1	5	3
Amidship gearset location	46	55	67	75
Unit axle gearset location	20	20	17	15
Unit motor gearset location	34	25	16	10
Right steering, right control	58	70	81	93
Right steering, center control	13	15	11	4
Left steering, center control	25	13	6	2
Left steering, left control	4	2	2	1
Demountable wire wheels	3	0	0	0
Demountable wood wheels	1	1	1	0
Regular wood wheels	96	99	99	100
Bevel drive	94	92	91	89
Chain drive	4	6	8	11
Worm drive	1	1	0	0
Roller drive	1	1	1	0
Floating rear axle	67	50	0	0
Semi-floating rear axle	26	49	0	0
Three-quarter floating rear axle	4	0	0	0
Dead rear axle	3	1	0	0

$1000 CARS

NUMBER—	1913	1912	1911	1910
Makes	32	56	52	43
Chassis	42	65	76	72
Cars	76	130	136	114
AVERAGE—				
S. A. E. H. P.	21.86	21.18	21.23	19.85
Bore, in.	3.75	3.78	4.01	3.79
Stroke, in.	4.32	4.37	4.21	4.25
Ratio	1.15	1.15	1.05	1.12
Piston disp.	178.0	186.2	185.8	164.5
Wheelbase, in.	103	104	100	96
Tires, in.	32x3½	32x3½	32x3	32x3
Price	$920	$954	$1,002	$879
PERCENTAGE—				
One Cyl.	.....	1	.....	.....
Two Cyl.	17	10	.....	.....
Three Cyl.	0	2	.....	.....
Six Cyl.	2	0	.....	.....
Four Cyl.	81	87	.....	.....
Straight Cyl.	14	5	10	17
2-cycle Cyl.	12	14	16	0
T-head Cyl.	5	7	11	13
L-head Cyl.	69	74	73	70
HOW CAST—				
Block	38	31	27	12
Separate	31	37	40	52
Pair	31	32	33	36
COOLING—				
Pump	29	39	24	30
Air	19	13	15	4
Thermo	52	48	61	66
RADIATOR—				
Tubular	79	80	81	85
Cellular	21	20	19	15
OILING—				
Splash	64	79	68	85
Splash-pres.	24	11	32	15
Pressure	2	.....	.....	.....
In fuel	10	10	0	0
IGNITION—				
Dual	50	60	48	40
Single	43	38	39	45
Double	7	2	13	15
ENGINE STARTER TYPE—				
Acetylene	19	20	0	0
Optional	2	0	0	0
Lever	9	5	0	0
None	70	75	100	100

$2500 CARS

NUMBER—	1913	1912	1911	1910
Makes	79	74	70	63
Chassis	93	82	76	83
Cars	235	216	234	159
AVERAGE—				
H. P.	35.90	35.45	35.60	30.65
Bore, in.	4.23	4.40	4.43	4.31
Stroke, in.	5.37	5.00	4.96	4.75
Ratio	1.25	1.13	1.12	1.07
Pist. disp.	372.00	336.5	324.2	287.9
Wheelbase	127	120	119	113
Tires	36x4½	36x4½	35x4	34x4
Price	$2,410	$2,570	$2,490	$2,144
PERCENTAGE—NO. CYLINDERS—				
Two	0	0	.....	.....
Four	43	86	.....	.....
Six	57	14	.....	.....
SHAPE CYLINDERS—				
T-head	45	44	28	25
L-head	47	50	57	54
Straight	8	6	13	14
CYLINDERS CAST—				
Threes	20	6	0	0
Pairs	46	68	67	58
Block	23	11	4	10
Sepr't	11	15	29	32
COOLING—				
Pump	89	97	94	70
Thermo	9	1	3	25
Air	2	2	3	5
RADIATOR				
Cellular	80	65	54	45
Tubular	20	35	46	55
IGNITION—				
Dual	72	61	50	32
2 spark	2	.....	.....	.....
Single	10	6	10	29
Double	15	33	40	39
ENGINE STARTER TYPE—				
Air	16	2	1	1
Elec.	46	2	0	0
Acet.	7	10	0	0
Mech.	4	6	2	0
Opt.	4	0	0	0
None	23	80	97	99

$4000 CARS

NUMBER—	1913	1912	1911	1910
Makes	58	84	62	58
Chassis	92	112	116	107
Cars	359	525	395	230
AVERAGE—				
H. P.	41.70	43.40	43.66	46.65
Bore, in.	4.63	4.65	4.87	4.76
Stroke, in.	5.62	5.41	5.39	5.11
Ratio	1.21	1.16	1.10	1.07
Pist. disp.	453.0	453.0	447.3	436.5
Wheelbase	130	129	124	124
Tires	37x5	36x4½	37x5	36x4
Price	$4,550	$4,350	$4,650	$3,917
PERCENTAGE—NO. CYLINDERS—				
Two	0	0	.....	.....
Four	42	55	.....	.....
Six	57	44	.....	.....
Five	1	1	.....	.....
SHAPE CYLINDERS—				
Straight	13	15	27	17
2 cycle	0	1	1	4
T-head	41	42	34	53
L-head	36	34	38	26
Knight	10	8	.....	.....
CYLINDERS CAST—				
Separate	12	18	20	25
Pairs	71	74	79	74
Block	10	5	1	1
Threes	7	3	0	0
COOLING—				
Pump	96	94	95	94
Air	3	3	4	4
Thermo	1	3	1	2
RADIATOR—				
Tubular	19	23	35	45
Cellular	81	77	65	55
LUBRICATION SYSTEM—				
Pressure	30	38	26	15
Spl.-pres.	38	.....	.....	.....
Splash	32	62	14	85
IGNITION SYSTEM—				
Dual	56	50	50	39
Single	12	7	7	11
Double	25	41	43	47
Dual 2	7	.....	.....	.....
ENGINE STARTER TYPE—				
None	20	80	95	98
Acet.	16	10	0	0
Lever	1	0	1	0
Elect.	41	2	0	0
Mechl.	8	5	2	0
Air	11	3	2	2

$1500 CARS

NUMBER—	1913	1912	1911	1910
Makes	81	86	86	75
Chassis	112	122	125	102
Cars	238	257	298	174
AVERAGE—				
S. A. E. H. P.	28.9	30.01	29.53	27.20
Bore, in.	4.18	4.26	4.19	4.14
Stroke, in.	5.05	4.86	4.64	4.41
Ratio	1.20	1.14	1.10	1.06
Piston disp.	295.	266.5	262.0	238.
Wheelbase, in.	119	116	114	109
Tires, in.	34x4	34x4	34x4	34x4
Chassis, Wt.	2504	.....	.....	.....
Gear Ratio	3.61-1	.....	.....	.....
Price	$1,662	$1,595	$1,585	$1,430
PERCENTAGE—				
Four Cyl.	88	95	.....	.....
Six Cyl.	12	5	.....	.....
L-head	75	78	70	87
T-head	21	15	10	10
Straight	4	6	18	3
HOW CAST—				
Pairs	38	45	60	18
Block	45	30	19	24
Separate	15	24	21	58
Threes	2	1	0	0
COOLING—				
Pump	75	66	49	50
Thermo	26	31	48	12
Air	2	3	3	8
RADIATOR—				
Cellular	63	50	25	10
Tubular	37	50	75	90
IGNITION SYSTEM—				
Dual	78	75	67	49
Double	11	13	17	43
Single	10	12	16	8
FUEL FEED—				
Gravity	81	90	93	81
Pressure	19	10	7	19
ENGINE STARTER TYPE—				
Electric	38	2	0	0
Optional	8	0	0	0
Acetylene	18	9	0	0
Air	4	2	0	0
Mechanical	1	2	1	0
No Starter	31	85	99	100

average $2,500 car has six cylinders of the L-head type cast in pairs. Two thousand four hundred and ten dollars is asked for the average car of this class as against $2,570 in 1912. Three percent of the cars in this classification are equipped with wire wheels. It is in this class of motor cars that the most of the wire wheels are to be found.

More than one-half of the $2,500 cars are sixes, 57 per cent, to be exact. The method of casting the cylinders in blocks of three has jumped in popularity from 6 to 23 per cent in the past 12 months, and thermo-syphon cooling has taken a similar rise to 9 per cent from 1 per cent last year. The wheelbase shows an increase of 7 inches, making it 120 inches for 1913.

Six cylinders of the T-head type with a bore of 4.63 and a stroke of 5.62 and developing 41.7 horsepower are part of the average $4,000 car's specifications. No change in piston displacement has been noted since 1912, and only an increase of one inch in the wheelbase. With the onrush of sixes the tire size has increased to 37 by 5.

Ignition systems in the cars selling for $3,000 and over show a very remarkable drop in the relative popularity of single dual and double ignition. The rise of the single system from 7 per cent last year to 12 per cent this year and the compounding drop in the double from 41 to 25 can be explained by the demand for simplicity and the growing reliability of magnetos and easier starting features.

Hands Across the Sea

European and American Practice in Motor Car Design Compared —Effect of Foreign Influence

AMERICAN cars show each year to a greater and greater extent the imprint of European design and practice and, conversely, a comparative study of American and European cars will show an increasing tendency of European designers to take up ideas and practices which have been tried out in American factories and embodied in American products.

The reason for this is one of production rather than of lack of engineering or inventive skill in America, or even of progressiveness of the manufacturers. America is often twitted with being very slow in adopting new features of construction in motor cars, as, witness, the Knight motor, which after being peddled for years from factory to factory in Amer- it up after its true worth had been proven.

There are many other cases in which American inventions have had to be taken to Europe for development. There are two reasons for this state of affairs. One of them is the enormous quantity of production of American factories as compared with the individual production in Europe, and the low cost of skilled labor there.

Nevertheless, motor car factories on the other side are rapidly equipping with American machine tools and installing American factory methods under the su-

pervision of American production engineers. Consequently the divergence between motor car factories on this side of the water and that on the other is not so wide as it has been.

The great increase in stroke and simultaneous decrease in cylinder diameter, with its concomitant decrease in horsepower rating which has been so noticeable in America, began in Europe several years before it did here and has proceeded much farther. European taxation regulations are accountable, in part at least, for the decrease in bore and increase in stroke over there. The motor car tax throughout Europe is much higher than in America and, as in many of the states here, is based upon the horsepower, the taxable rating of which is determined by the cylinder diameter and not affected by the stroke of the motor. So, in order to keep down the taxable horsepower, the bore has been made very much smaller, but in order to keep up the actual horsepower delivered by the motor the piston displacement is kept almost as high simply by lengthening the stroke of the piston. At the same time, its very decided advantages have had an additional effect in making the long-stroke motor popular.

Comparison of Bores

This change in cylinder dimensions has developed to the point where the average bore of European motors, as shown in the cars exhibited at Olympia and the Paris salon during the winter was but 3.1 inches, as compared with the 4.9 inches of the average American car this year. In spite of this smaller bore of European cars, the stroke is considerably greater, being 5.25 inches as against America's average stroke of 5.15 inches. The effect on the S. A. E. horsepower rating, which corresponds with the taxation rating formula employed in Europe, is very noticeable. The average horsepower rating of European cars is only 20.2 horsepower, while that of the average American car is 33.6 horsepower. The piston displacements and the actual power delivered by the two motors is very nearly the same. Americans feel that the 1913 motors are getting to be quite the long-stroke style but we are behind the times from the European point of view with our little stroke-bore ratio of 1.23 to 1 when those on the other side can point to an average ratio of 1.70 to 1. In France the stroke is practically twice the bore in the average car. Some of the Franch cars have an absurdly small cylinder bore as compared with American standards. For instance the Zebra has cylinders 2 by 4 inches and the Filian has an engine 2⅛ by 4¼ inches in size.

Driving the timing gears, pump, magneto and other accessories by silent chain, which is beginning to come into favor in America, is almost universal in Europe. This is accounted for by its decrease of noise and is helped by the fact that on the standard European motor the L-type of casting is adopted with thermo-syphon water circulation so that a single chain can be used for the entire motor.

Single ignition has come to be the rule in Europe rather than the exception, whereas those of us in America who do not employ a dual system with a battery for starting on emergencies are credited with a good deal of temerity. A single high-tension magneto with a fixed spark in the smaller motors and a variable advance in the larger is found on at least 95 per cent of European cars. European motors are of small size and cranking them is not difficult. Magneto and carbureter manufacturers have made it their business to build accessories which make for easy starting, and the average European motorist looks upon the magneto as the last place for a breakdown.

Motor Starters Few in Europe

Europe manifests a decided lack of enthusiasm for the motor starter which has taken America by storm. The craze over there is for the acme of simplicity, and any automatic method of starting the motor is certain to complicate the car. There is only one or two concerns that are fitting motor starters and those are installed as extras.

Wire wheels, of course, are almost universal in Europe, a decided difference from American practice, in which wire wheels are offered only on five cars, and those are offered merely as options. In practicaly every case the wire wheel itself is demountable instead of the rim. It is safe to assume, however, that this feature of the demountable wheel will be adopted much more widely in this country within a year or so.

Contrary to the general conceptions, the radiator of European car usually is not at the dash, its location on most chassis being ahead of the motor as it is in America. This dash radiator, however, is distinctively a European feature, although it has been adopted under European license by one or two manufacturers in America.

Tires on European Cars

European cars, as a rule, would be considered under-tired in America. Although there are many cars with enormous tires, by far the greater per cent of them have comparatively small ones, the average probably running not much over 34 inches. Wheel treads, that is, the distance between either the two front or the rear wheels, is subject to much variation in Great Britain and on the continent, as there is no uniformity at all in the wheel track. This varies from 30 inches up to 60 inches or more. The necessity for standard wheel tread is not nearly so urgent in Europe as it is in America because with the network of excellent hard roads the motorist does not have to follow the wagon tracks as he does over America's country highways. European good roads also are to be credited for the comparatively low clearance of the car, some of them being not over 3 to 4 inches from the ground, while the average is perhaps not over 7 inches. In America a 9-inch clearance would be considered too low for traversing some of our hogback roads.

There is one peculiarly European feature which never has received any encouragement at all in America, and that is the use of brakes on the transmission system rather than on the rear-wheel hubs. This feature, however, is losing ground slightly in Europe and the brakes are being located to some extent upon the rear or front wheels. On the higher grade of cars in Europe these brakes are nearly always provided with means of cooling them with water, so as to prevent their overheating in climbing the mountains on the continent. This is a feature that will probably have to be incorporated in American cars if mountain travel is to become as popular on this side of the water.

European Selling Methods

A feature of the European method of marketing which has made for a wide variation in body styles and equipment is that of selling the chassis alone and allowing the owner to have a body built, fitted and equipped to suit his own fancy. A car as marketed by a manufacturer on the other side is simply the bare chassis without body and usually without tires. This, perhaps, accounts to some extent for the lack of motor starters and also for the slowness with which electric lighting has been taken up. Within the past year, however, there have been one or two makers who have provided arrangements for installing either storage batteries or generators for lighting on their machines, but where they have listed complete cars have, notwithstanding, listed them with oil lamps.

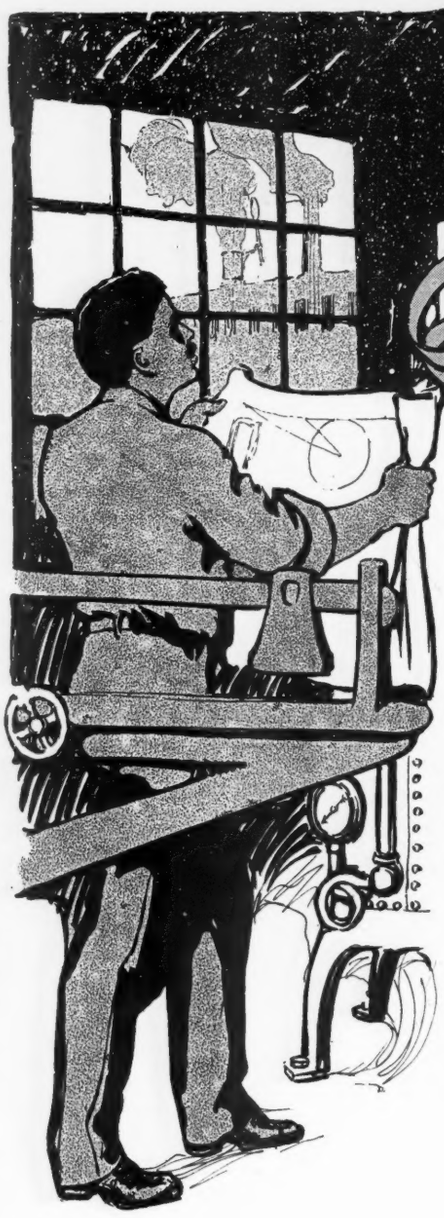
COMPARING AMERICAN AND EUROPEAN PRACTICE

AVERAGE AMERICAN CAR

Bore	4.19 inches
Stroke	5.15 inches
Horsepower	33.6
Stroke-bore ratio	1.23 to 1
Camshaft drive	Spur gear
Ignition	Dual
Control	Hand
Cooling	Pump
Wheels	Wood
Demountable	Rims
Radiator	Front of motor
Bodies	Stock
Equipment	Complete
Road clearance	10 inches
Tread	56 and 60
Brakes	Rear wheels
Starters	Electric

AVERAGE EUROPEAN CAR

Bore	3.10 inches
Stroke	5.25 inches
Horsepower	20.2
Stroke-bore ratio	1.70 to 1
Camshaft drive	Silent chain
Ignition	Single
Control	Fixed
Cooling	Thermo-syphon
Wheels	Wire
Demountable	Wheels
Radiator	Front or rear of motor
Bodies	To order
Equipment	None
Road clearance	7 inches
Tread	30 inches and up
Brakes	On transmission
Starters	None



The Cars

New Models Improvements

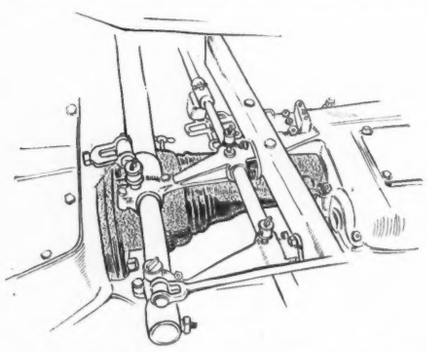
HEREWITH Motor Age presents its annual review of the new models as announced by American manufacturers. The descriptions are in no sense intended as catalogs, as complete tables of specifications appear on other pages of this issue. The purpose of the descriptions below is to bring to the attention of the motoring public such changes, developments, and departures as have been incorporated in the design of the principal makes for 1913.

The motorist will recognize a few new faces, he will miss a few, but the majority he will recognize as old acquaintances. Among the new ones, the motorist will welcome the Chevrolet, a Detroit recruit, and the product of the well-known racing driver; the Edwards-Knight, with its advanced practices, such as the adoption of the non-poppet engine, worm drive, Lanchester springs, and wire wheels; and the Henderson, of the Indianapolis clan, with its unique design. Other names that are new are the Croxton and the Keeton, which are the outgrowth of the former Croxton-Keeton; the Studebaker, formerly the Flanders and E-M-F; the Flanders, formerly the Everitt; the Touraine, formerly the Nance; the

ABBOTT-DETROIT

INNOVATIONS have been made in the Abbott-Detroit line. The most notable is the abandonment of the characteristic valve-in-the-head motors affected by the early 30s, and the adoption of the Continental L-head motor in a unit power-plant. Model 44 has been continued as the 44-50. While still built on the same lines in general, the new model has undergone several noticeable refinements of detail. A new model, the 34-40 has been brought out, which though of about the same size as the older small cars, bears no direct relation to them, being a fac-simile of the 44-50.

New features are underslung springs all around and an electric starting system. The underslung springs bring the centers of both weight and suspension closer to the ground without necessitating any radical change in the design of the frame, springs, or axles, and without reducing the clearance. The new starter is of the two-unit type, the starting motor being separate from the generator, and driving the crankshaft through a ratchet and pawl. It is controlled by the spark-advance lever. The same six body styles of last year are continuer with improvements and one new type. The battleship roadster is continued on the 44-50 chassis, to be furnished on special order.



Alco introduces universal joint between clutch and gearbox to compensate for frame distorsion

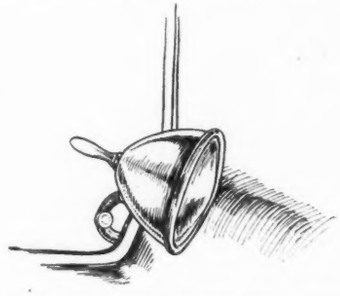
ALPENA

A SINGLE six-cylinder model will be produced by the Alpena Motor Car Co. The motor is the Rutenber six-cylinder type, with cylinders 3¾ by 5¼, cast in pairs. The valves are located on the left side, their springs and tappets inclosed by cover plates. The motor is suspended on three points. The clutch is of the faced multiple-disk-in-oil type, the facing being Raybestos. The three-speed selective gearset is located amidships, and drives the floating rear axle through a Spicer shaft to the rear axle.

A 135-inch wheelbase and 36 by 4-inch tires are used, the tires being mounted on Baker demountable rims, one spare furnished. The car is electrically lighted and started by a dynamo and storage battery, which also furnishes current for ignition.

ALCO

WITH the center of gravity 1 full inch closer to the ground, the Alco six for 1913 appears in a single refined and developed chassis. Always low and racy in appearance, this improvement greatly increases the stability and safety of the car. No sacrifice of road clearance or any radical change in design was involved in this change, but merely the flattening of the springs. Another improvement is the substitution of three-quarters elliptic springs in the rear for the former half-elliptics. The Gray & Davis electric lighting and starting system and Truffault-Hartford shock-absorbers have been added as regular equipment. Tire sizes have



Alco fits hand-controlled electric searchlight on right of dash as stock equipment

# of 1913

Engineering Progress

Richmond, at one time the Wayne, and the Buckeye, little brother to the Lambert. The Thomas, Grout, DeTamble, Brush, Corbin, Elmore, Marquette, Lion, and the Otto are among the missing.

Some makers have adopted radical changes in the character of design incorporated in their products. The Amplex has practically abandoned the former two-cycle designs, bending its present energies to the production of a standard four-cycle car. The Great Western has abandoned its characteristis valve-in-the-head. The Colby has given up its underslung frame, and the Regal has added an overslung to its line. The Mitchell, Glide, King, Oldsmobile, Stevens-Duryea and others have more or less completely renovated former patterns, while in a large number of instances, notably the Cole, Colby, Empire, Flanders, Fiat, Garford, Hudson, Herreshoff, Republic, Stearns, Speedwell, Studebaker, Stutz, Simplex, Warren, Inter-State, Jackson, Knox, Marmon, Moon, Oakland, Oldsmobile, Pope-Hartford, Packard, Premier, McIntyre, Correja, Paige, Lozier, King, Haynes, Little, and Zimmerman entirely new models have been brought out.

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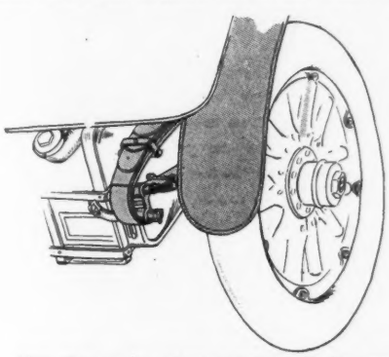
been increased, the front having been enlarged from 36 by 4 inches to 36 by 4½, and the rear from 36 by 5 to 37 by 5. The front wheels have also been given increased dish and camber, lending increased strength on crowned roads. A universal joint has been placed between the clutch and gearset.

The crankcase has been extended around the flywheel and clutch. A new dry-plate clutch has been installed, completely inclosed, and easier of operation than former types. A gasoline gauge has been installed, the brakes have been improved by division into two shoes, and a new adjustable fan has been fitted to the motor. The accelerator has been moved from the position between the pedals, to the right. The body has also been improved and enlarged. The tonneau seats are 5 inches wider, and the door 2 inches wider, and the distinctive white belt has been extended around the front seats as well as around the outside of the body. Special inclosed cars are also furnished.



Alco changes to three-quarters elliptic car springs

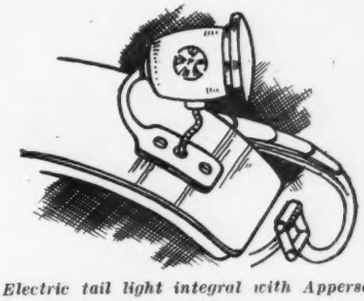
AMES

IN its second year, the Ames continues in a series, on the single-chassis plan, with few changes, except in body lines. The car uses a Continental motor, 4⅛ by 5¼, of the standard L-head type, with valves on the left side. The motor is cast in block, and employs the dual ignition system. A Remy magneto is used this year instead of the former Splitdorf. Other changes are an increase of 2 inches in the wheelbase of the car, bringing it out to 118 inches, and the addition of a Disco starter and generator-supplied electric lights to the equipment. The flywheel this year is inclosed in the motor-base, with the gearset bolted as a unit with it. Center control is used, and left-hand steer.

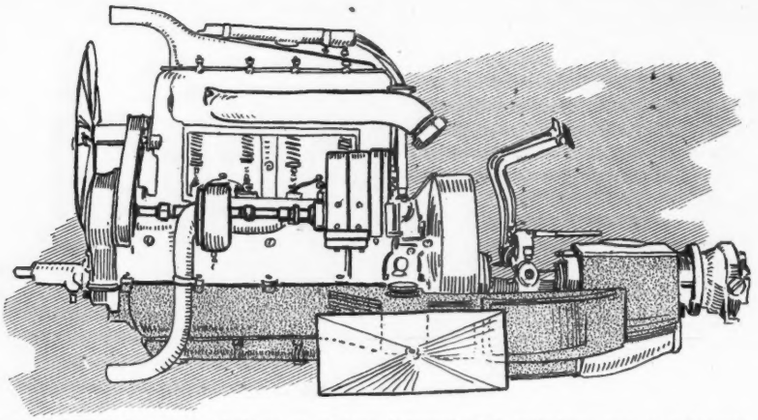
Three-quarter elliptic rear springs are used, as formerly, and demountable rims are included as stock equipment. The body has been changed in design, setting lower within the guards, and having a deep cowl dash, with a built-in windshield. The running boards have been cleaned up, and fully webbed to the body, concealing the frame. The general tone has been improved, and added luxuries such as deeper upholstery, concealed door handles, etc., are to be noticed.

AUSTIN

AGAIN appearing in three six-cylinder models of high power, the Austin 77 is offered with slight changes, but substantially the same in general make-up as formerly. A feature that is interesting, and which constitutes the most notable modification, is the adoption of a two-speed rear axle. This consists of two separate drives to the differential, which affords two speeds



Electric tail light integral with Apperson fender



American Scout has upper half of crankcase integral with cylinders, and is supported on lower half. The cylinders may be swung back as on hinges

direct. The former four-speed gearset is thus dispensed with, being replaced by a simple three-speed type, which in any speed may be made to drive the rear axle at either of two reductions. This feature was added late to the line, and hence will be installed in the Austin specials only.

Direct drives at 3½ to 1 and 2 to 1 are had by means of the two-speed rear axle. This means that high-speed work may be done on direct drive without necessitating a gear reduction for touring speeds. The result is very little running on the geared reductions. Two reverse speeds are also afforded, one of which is low enough to prove valuable in a bad stall.

No other radical departures from last year's standards will mark the 1913 models, save that there will be a noticable trend toward greater luxuriousness in the finishing and appointments. The ivory white and tan finish will be continued, as will the pneumatic starter. A new nine-passenger body is shown. Models 66, 4½ by 5½, and the 55, 4 by 5, are new models, smaller but similar to the 77.

ARBENZ

ADVANCES along the lines that have been characteristic of Arbenz construction in previous years mark the line for 1913. Minor details have been refined and simplified, the upholstering has been deepened, and the seats widened. The cushions have been slanted to the rear. An electric starting and lighting system has been installed; the former semi-floating rear axle, mounted on roller bearings, has been replaced by a ball-bearing floating type, and the brake drums have been enlarged from 14 to 16 inches in diameter. The 36 by 4 tires are mounted on demountable rims, a spare being included in the standard equipment. A special bracket is provided to carry the rim, at the rear of the car. Equipment will be complete on all cars, and wire wheels will be furnished where desired.

AMPLEX

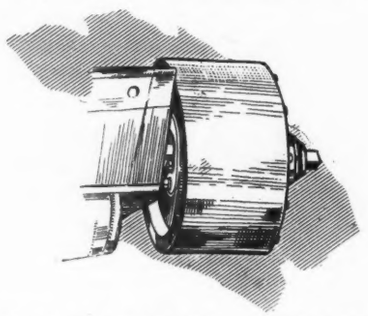
COMPLETELY reorganized, the Amplex line for 1913 is announced in a single standard chassis, with a promise of other types to follow, notably the Knight type motor. The two-cycle type, formerly made by the old organization, has been discontinued as a stock production, but will be furnished on special order to those who prefer this type to the four-cycle.

The chassis announced will be a six-cylinder car, of standard lines, although there are several advanced practices to be noted. The motor is of six cylinders cast in threes, with a bore of 4⅛ inches and a stroke of 5¼. The valves are arranged side by side on the right side, and are actuated by a gear-driven camshaft. The circulating-splash system of lubrication is used, with a pressure gauge on the dash.

Remy dual ignition is used, and a Rayfield model D, 1½-inch carbureter is used. The carbureter is water-jacketed, and fed by pressure from the tank at the rear of the chassis. The clutch is of the cone type, and the Amplex rear axle gearset is retained. The wheelbase is 130 inches, and the tires 36 by 4½, on demountable rims. An especial feature in connection with the front axle is a castering of the steering knuckles. These are slanted forward from top to bottom, which causes the kingbolt to lead the front wheels, caster-like, independent of the action of the tie-rod. The Northeast electric lighting and starting system is installed. Bodies are made for seven passengers, being fitted with sockets for auxiliary chairs, for which an extra charge is made.

AUBURN

FIVE models constitute the Auburn line 1913. Two of these are continuations of last season's models. Two sixes are offered, one, the 6-50, a continuation, and



Austin 77 has flywheel of small diameter and wide face, not extending below motor base, allowing low motor suspension

seven passengers, being fitted with sockets for auxiliary chairs, for which an extra charge is made.

the other, the 6-45, a new model. Last year's 40 N is this year's 40 L, while the 30 L and the 35 L have been supplanted by the 33 L and the 37 L. No change has been made in the 6-50 except the addition of the Ward-Leonard lighting system as regular equipment. The new six employs a long-stroke motor, 3¾ by 5½-inch bore and stroke with valves on the left side. The clutch is of the leather-faced cone type, and the gearset of the three-speed selective variety. A floating axle is used, and 36 by 4-inch tires. The wheelbase is 130 inches. The wheelbase on the 40 L is 122 inches, 2 inches longer than on last year's car. The tires this year are 36 by 4, as against 37 by 4 in 1912.

Model 33 L uses the new Rutenber 3¾ by 5½, four-cylinder block motor, with valves on the left side. A leather-faced cone clutch and three-speed selective gearset are used, the rear axle being of the floating type on Hyatt roller bearings. The wheels are 34 by 3½ inches all around, with a 112-inch wheelbase. Model 37 L has a motor 4¼ by 4¾, of the monoblock type, with valves on the left side. A multiple-disk-in-oil clutch and three-speed selective gearset are included in the unit power plant, and the floating axle is equipped with ball-bearings throughout. The wheelbase of this model is 115 inches, and the tires 35 by 4. The Remy magneto, Schebler carburetor, Rutenber motor, and Ward-Leonard electric lighting system are used on all models.

AMERICAN

UNDERSLUNG suspension, the feature of the American, is continued on all models for the 1913 season. The American Motors Co. is one other maker advocating continuous series instead of yearly models as a policy of production. No change is made in the number or character of cars with the exception of refinement of components. The most notable of these are in the Scout model, known as model 22-A. The proportions of this model have been amplified, being a mean in size between the 20 and 30 of last year. Like the 20, the motor is a four-cylinder long-stroke block type, with valves on opposite sides. The unit power plant idea is carried out in this model, integral arms on the gearset and crankcase meeting, and being mutually supported on four points, arranged in a diamond. The bore is 3¾ by 5, and, contrary to usual practice, the upper half of the crankcase is integral with the cylinders, while the lower half supports the motor and crankcase. This enables the cylinders to be laid back as on a hinge, permitting the adjustment of the crankshaft and connecting-rod bearings, and removal of pistons from above.

A cone clutch and three-speed selective gearset are used, and the propeller shaft is inclosed in a torsion tube. A floating

axle is used, and the internal expanding brakes in the rear wheels are mounted side by side. But two bodies are fitted to this model, a roadster and a coupe. The wheelbase is 105 inches, and the tires are 36 by 3½ on demountable rims. Last year's model 30, this year the 32-A and 34-A, is continued in a roadster, coupe, phaeton and limousine. The Traveler model is continued as model 54-A and 56-A, in a four-passenger, a six-passenger and a limousine. The 54-A has a 124-inch wheelbase and 40 by 4 and 41 by 4½ tires, and the 56-A a 141-inch wheelbase and 41 by 4½ tires all around. The traveler models are equipped with the Peru electric lighting and starting system, the Tourist with a dynamo, electric lights only, and the Scout with electric side and tail lights, and gas headlights.

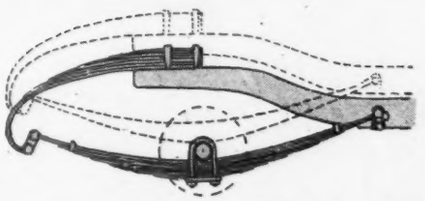
APPERSON

ONE more manufacturer, Apperson, has abandoned the yearly model idea, producing on the series plan, making improvements as designed, without reference to the time of year. The 1913 series is almost identical with that of 1912. Full equipment is included in the standard price, with the added features of a compressed air starter and electric lights. The line includes all five of last year's models, three of which are of 45 horsepower, and two of which have 55-horsepower motors, both of which motors are of four cylinders with valves on opposite sides.

BERGDOLL

BERGDOLL cars for the new season, the 40 Fairmount models in particular, have been greatly refined in appearance, and enlarged by the use of a longer frame, the wheelbase, formerly 115 inches being in the new models 121 inches in length. Mayer carbureters, used last year, have given place to Scheblers on the new models, and on the 30 the 34 by 3½-inch tires have been enlarged to 34 by 4.

The most notable change, however, is in the adoption of U. S. L. electric starting and lighting system. Motors are of the four-cylinder block type, with cylinders 4 by 5 15-16 and 4 by 4½, respectively, with valves located in pockets on the left



Showing lower frame suspension in Abbott-Detroit by underslung springs

and in the cylinder heads. The crankcase is of the barrel type, with the oil reservoir bolted on the bottom. The multiple-disk clutch and gearset is included in the unit power plant in both models, providing three speeds in the 30 and four speeds in the 40.

Five-passenger, seven-passenger and four-passenger touring cars and Louis J. roadsters are fitted to all models. Equipment is complete on each model, in top, windshield, demountable rims, etc.

BUICK

FIVE models are included in the 1913 Buick family, four of them continuations of older models, and one, the 40, a new production. The 24, 25, 30 and 31 are little different from last year. The principal departure from former practice is the use of I-beam front axles instead of the tubular type used heretofore. Changes are noted in the body lines that give them greater grace. The Disco starter and combination electric side and tail lights have been added as regular equipment on all models.

The new 40 has a motor of four cylinders, 4¼ by 4½, with valves overhead as in former practice. The wheelbase is 115 inches, and the tires are 36 by 4. A cone clutch is used, and the three-speed gearset is placed amidships, operated by inclosed controls. This model also has a floating rear axle. The new model is lighted throughout by electricity, supplied by a Vesta dynamo and battery.

BUCKEYE AND LAMBERT

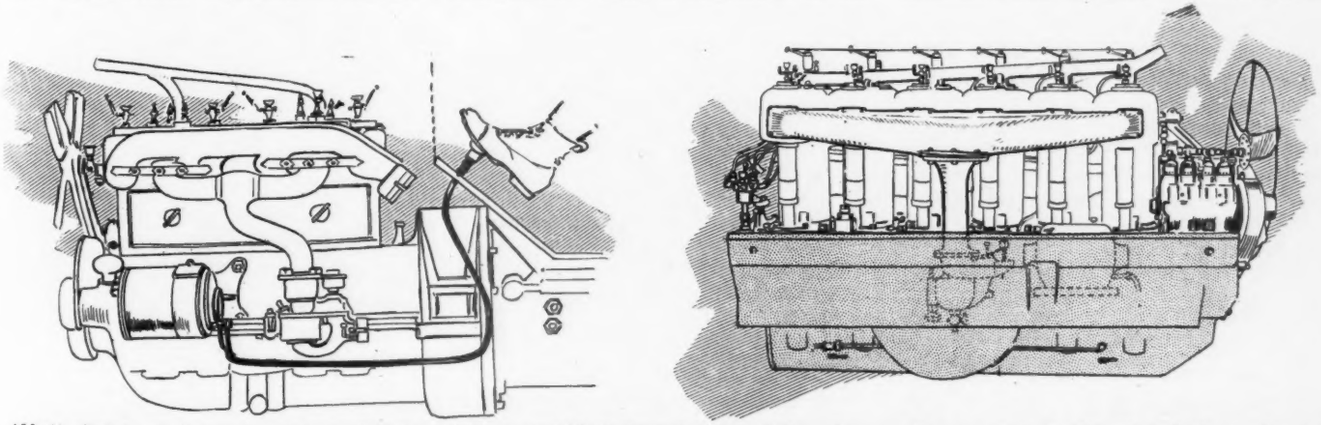
LAMBERT cars are hereafter to be known as Buckeyes, two of the three 1913 models bearing the new name. The friction drive which is the feature of this car is retained on all models. Instead of the five chassis models, with the same 4⅛ by 4¼ motor but having five different wheelbases, the three cars for the 1913 season will have different motors and wheelbases. The former features of friction transmission, single-chain drive and elliptic rear springs are retained with changes in the lubrication of the transmission, Titanic front springs and three new motor sizes. The large model, Lambert 99, has a motor 4⅛ by 5¼ and a wheelbase of 117 inches.

The Buckeye 40 has a motor 3¾ by 5¼, of Rutenber make, and a wheelbase of 112 inches. Buckeye 10 is similar to the larger Buckeye, except that it has a motor 3¾ by 4¼, and a wheelbase of 106 inches. These cars are all made in touring car types, and are listed with a full equipment. A new feature in domestic cars is shown on this car, which consists of a flexible steel coupling on the flywheel, such as was recently featured at Olympia. This coupling consists of four steel straps, opposite corners secured to the flywheel and a driving spider on the shaft, respectively. This coupling permitting displacement of the shaft upon the warping of the frame, with the minimum of friction.

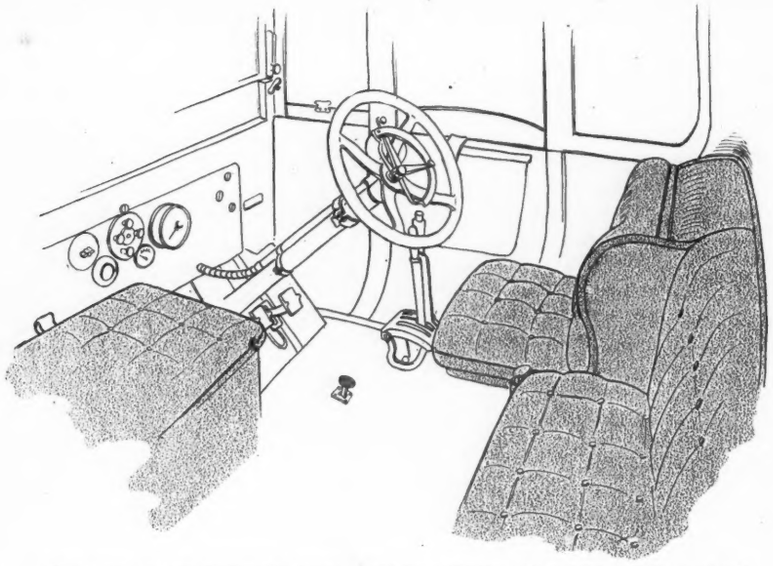
CADILLAC

CONSISTENT with 5 years' practice in the past, the Cadillac car appears in a single chassis model, which is the product of constant development of the original Cadillac 30, which appeared in 1908. While the present representative is the direct descendant of this first car, it little resembles its forbears. The car has been refined and developed until today, consistent with a price over $500 in advance of that of the first of the family, the car is practically 20 horsepower more powerful. From this extreme comparison, the difference in the 1913 and 1912 production may be better understood.

The new car embodies the same features that always have characterized the car, such as copper waterjackets, individual cylinders, removable cylinder heads, and platform rear springs. The motor dimensions have been increased from 4½ square



Abbott electric starter operated by push-button. Drives crankshaft through silent chain. Deep crankcase web on Austin 77, inclosing carbureter lighting generator and magneto, and dispenses with mud pan



Cole four to five passenger coupe showing staggered driver's seat and controls

to 4½ by 5¾, thus signalling the conversion of the Cadillac to the long-stroke fraternity. This increase in displacement gives the engine from 40 to 50 horsepower, it is said. The construction of the engine is heavier and more substantial throughout, and the timing drive is by silent chains. The bearing length has been increased, and Timken bearings have been fitted in the steering knuckles.

Tire sizes have been increased from 36 by 4 to 36 by 4½ all around. The rear side springs have been lengthened from 44 to 48 inches, and the frame has been brought 1 inch closer to terra firma for the sake of stability. Both control levers have been taken into the body, and though right-hand drive is retained, the right front door may be used. The wheelbase has been lengthened from 116 to 120 inches, and the body lines have been greatly improved, although characteristically similar to the 1912 types.

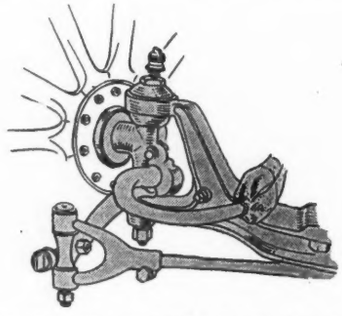
The Delco electric system has been developed and simplified. The former controller and ampere-hour meter has been eliminated, and the entire system now runs on 6 volts. The battery is of three cells, of standard vehicle design, instead of the former twelve-cell type. The distributors of both battery and magneto ignition systems are now driven independently of the generator, on the right side of the motor, while the generator is now geared to the flywheel at 25 to 1, instead of 20 to 1, and is driven from the crankshaft by a silent chain. The spark advance is automatically controlled by a ring governor.

Seven body styles, all with cowl dashes, are fitted. Full equipment of higher grade than formerly furnished is included at the slightly advanced price, while last year most of it was extra.

CARTERCAR

REMAINING practically unchanged in mechanical details, the single Cartercar chassis is continued for 1913 with four new body styles, known as model 5A, 5B, 5C and 5D. These models are respectively a five-passenger touring car, a roadster, a three-passenger coupe and a five-passenger sedan. Each is equipped with an electric starting and lighting system.

Notable among the changes in this car for 1913 are the new location of the gasoline tank on the dash, a new one-piece windshield, a new adjustment on the friction change-gear, and small refinements in



King-bolt thrust is taken by Timken bearing on Cadillac front axle

the motor. The horn on the new model is under the hood, and a new double rear spring is used, which is said to improve the riding of the car. The new sedan body is the first of this type to be used on the Cartercar. All trimmings are in nickel on the 1913 cars, while the visible bright work has been greatly decreased by cleaning up the dash and using concealed hinges and door handles.

CAMERON

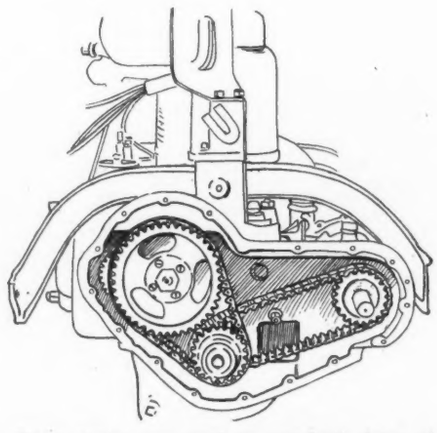
AIR cooling continues to be the feature of Cameron cars. Practically no change has been made in this car for the 1913 market. Four models are produced, as last year, styled 28, 29-A, 30 and 32. These designations refer to body styles, models 28 and 29-A being a two-passenger runabout and five-passenger touring car, respectively, mounted on the same four-cylinder chassis. Models 30 and 32 are corresponding bodies, on the six-cylinder chassis.

The two chassis are similar in all respects, except that the six has six cylinders instead of four, and the wheelbases on its two models are longer than those on the four. Model 28 has a wheelbase of 104 inches, model 29-A, 110 inches, model 30, 114 inches, and model 32, 130. The valve-in-the-head, individually-cast, air-cooled motor, the cone clutch, the full elliptic springs in the rear, the Cameron transverse, direct-drive rear axle gearset and floating axle are all retained, as formerly.

CASE

LAST year's 30 and 40 are continued by the Case company for 1913 buyers as models N and O, respectively. Changes are to be noted in both models, those in the 30 being the most notable. These consist of the change from the T-head type of motor to the L-head, and from the casting of cylinders in pairs to the monoblock engine, with gearset, flywheel and engine included in a unit power plant. The dimensions of the engine have been changed from 4½ by 5 to 4⅛ by 5¼, consistent with the movement for longer strokes. The valves are located on the left side of the new engine, and their mechanisms inclosed.

The gravity system formerly used has been discarded in favor of pressure gasoline feed. The new gasoline tank, with a capacity of 14 gallons, with a 3-gallon reserve, is located in the cowl dash. The rear axle is of the floating type this season, instead of the previous semi-floating form, the wheelbase has been shortened one inch from the former 116 inches and electric lighting and a gas starter have been added to the equipment. Model O differs from the previous 40 only in that the gasoline tank has been moved to the rear of the car, feeding to the carbureter by pressure; option is offered on the ignition; the wheelbase has been elongated from 120 inches to 125 inches, and 37 by 4½ tires are substituted for the 36 by 4 sizes used last year. The latter model is equipped with a five-passenger and a seven-



Silent chains are used in camshaft drive of Cadillac 1913 model

passenger touring car and a two-passenger roadster. The other is equipped with a five-passenger touring or a two-passenger roadster body.

COLUMBIA

COLUMBIA cars appear for 1913 identical with the models of 1912. As will be remembered, the Knight type of motor was a special feature. The models are designated mark 88 and mark 85, respectively, to correspond with last year's Knight and Cavalier models. Each has a bore and stroke of 4⅞ by 5⅛, cast in pairs and provided with Bosch ignition and Stromberg carbureters, differing in that the Knight motor utilizes sleeve valve-action, whereas the other type has poppet valves opposite. The gasoline feed is by pressure from a tank located at the rear and under the chassis frame. Cone clutches are used with gearsets located amidship.

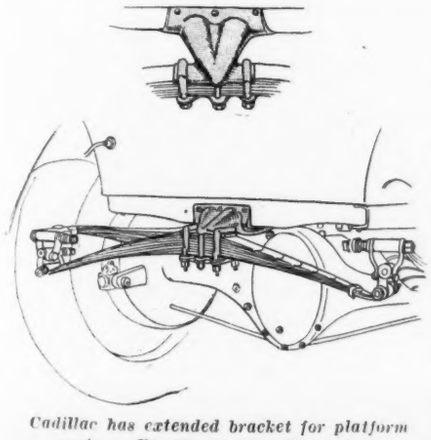
The Knight model has four speeds and propulsion through radius rods, while mark 85 propels through its springs and has a range of but three speeds. Floating axles are used on each model.

The wheelbase of mark 88 is 129 inches, while that on mark 85 is 120 inches. Control levers on the Knight model are located in the center, while those of the poppet-valve car are to the driver's right, each model being steered from the right-hand side. Tires on both models are 36 by 4½ inches. The same body styles as last year, including touring cars, runabouts and closed cars, are furnished for the new series, with complete equipment, at the price listed.

CROW-ELKHART

THREE new chassis are announced for 1913 by the Crow Motor Car Co. with which the continued model 44-50 will be offered for 1913. Two of the new chassis have motors of six cylinders, the other being a light four. Model 55-60 carries a seven-passenger body on a wheelbase of 136 inches. Its cylinders are 4⅛ by 5¼. Model 45-50 is of six cylinders 3¾ by 5, with a wheelbase of 122 inches, and carries a five-passenger body.

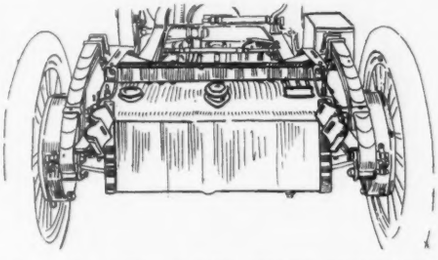
These cars each have T-head motors, with the cylinders cast in pairs, and carry an electric lighting and starting device, and floating rear axles. Model 35-40 is of four cylinders, also of the T-head type, with cylinders 4⅛ by 5. Five-passenger touring and two-passenger bodies are furnished with this chassis. All Crow-Elkhart cars are equipped with a patented center control in which the levers are carried in the center of the car. Bodies have been improved in the new series, and are equipped with tops, speedometers, demountable rims, five lamps, and a horn.



Cadillac has extended bracket for platform spring, allowing longer side springs

COLE

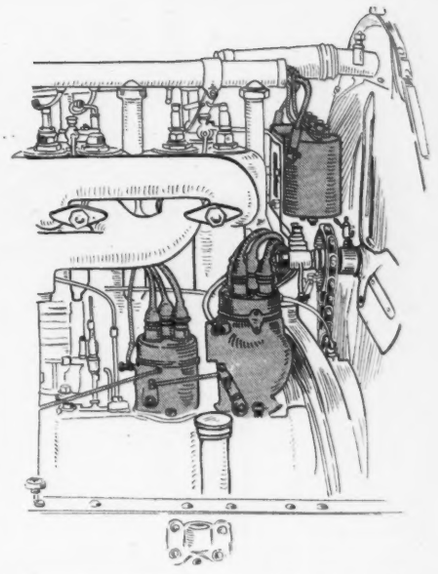
TWO noteworthy additions have been made to the Cole line for the incoming season. The first is the addition of a six to the catalog, and the second is the adoption of the Delco system of lighting, starting and ignition on all models. In 1912 the Cole 50 made its debut, with the Cole 40 continued in its second series. This year these cars are continued in their second and third series respectively, and the six added. The original Cole, last year styled DD, with its 4½ by 4½ motor, is known as model 40, while last year's new production, the 50, continues under the same name, and with few changes.



New tank equipped with gasoline gauge fitted on Cole

The new oiling system adopted last season is still to be found on the current models. A change has been made in the dual system, gravity feed having given way to pressure feed, with the tank hung below the frame in the rear. The carbureter has been changed, the Schebler model O having replaced the model L used last year. The frame has been lowered by a drop of 2 inches just behind the dash. The clutch has been provided with six springs instead of the previous one, and a full ball-bearing release. The magneto and acetylene starter have been discarded in favor of the Delco system. This system has frequently been described, and is almost identical in this installation with others, except in details of application.

The new six follows the lines of the fours in all but the number of cylinders, the increased size and minor structural differences. It employs six cylinders cast in pairs, with inclosed valves all on one side, with the crankshaft supported on four bearings. The engine, clutch and flywheel are an inclosed unit with the gearset. The bodies have been refined, and all concave surfaces eliminated. The new berline limousine is provided with simple continuous panels, and arched rear doors. A new dash arrangement is provided, which is unusually clean, all gauges, switches, etc., being brought forward on the extended rim of the cowl. A new coupe body is offered, of exceptional luxuriousness.

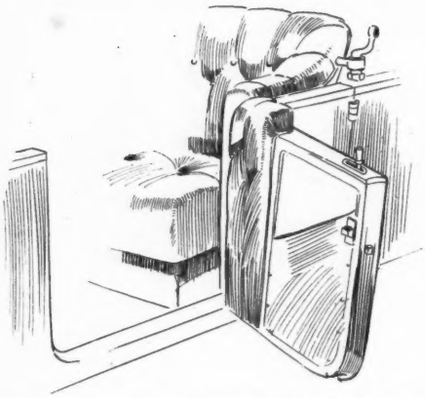


Compact arrangement of double distributors and single-unit coil on Cadillac

CORREJA

MOST prominent among the changes to be found in the Correja line is the addition of a six-cylinder model. The cylinders are cast in pairs and are of the T-head type. The bore is 4¼ inches and stroke 5 inches. The car is rated at 55-60 horsepower. Ignition is by Simms high-tension magneto with set spark. Provision is made for double ignition. The carbureter is a Schebler 1½-inch with double eccentric. Lubrication is by gear-driven pump through the hollow crankshaft. The oil reservoir is in the lower half of the crankcase. Control is by stationary quadrant on the steering post; long lever for throttle and foot accelerator. Steering is by the worm and gear system.

The clutch is of the cone type with flat springs under the leather facing. The gearset provides for three selective speeds forward and reverse and its location is on the rear axle. The gears are of chrome-nickle steel with nickel steel shafts. The propellor shaft is a forging. It has one double universal joint at the forward end. It is inclosed in torsion tube. The rear axle is floating. The differential is removable through the axle housing. The front axle is a drop-forged I-beam. Artillery wheels to take tires 36 by 4 inches are furnished as stock equipment. The front springs are semi-elliptic, 36 inches, six leaves. The rears are three-quarter elliptic, 44 inches long. The brakes are external and internal on the rear wheels, working on pressed steel drums and equalized by differential brake equalizers.



Chalmers front door designed to facilitate entry and exit

The chassis is fitted with two bodies, a torpedo roadster and a cowled touring car. Changes in the four-cylinder line correspond with the specifications for the new six where indicated.

CHALMERS

A SIX-CYLINDER features the 1913 Chalmers line, in addition to two fours continued from last season. The six is not a new model as it was introduced at the 1912 shows, being continued practically without structural change for 1913. This year its manufacture has been taken up in earnest, profiting by last year's experience. The 30, the original Chalmers model, introduced in 1909, continues with changes of a minor nature, while the 36, now in its second year, shows no mechanical departures from its original design, although minor improvements have been made. These models are this year to be known as the 16, 17 and 18, respectively, instead of the 30, 36 and six.

Changes are noted in the pneumatic starting system. Formerly a check valve was placed in one of the cylinders, by which compressed gas was tapped from the cylinders and stored in a tank. This year a chain-driven four-cylinder air pump is located at the front of the motor, which stores pure air in the tank, which may be used for inflating the tires. Rear axles on the Chalmers, formerly floating, are this year of the three-quarters floating type, the former driving crab between the floating drive-shafts and the wheels, being displaced by flanges, bolted to the wheels. The transmission brake formerly employed on the 30 is supplanted on the model 16 with external contracting brakes on the rear-wheel drums. Following the Chalmers policy of standardization, the same steering gear is used on all models, with 18-inch hand wheels on the four-cylinder cars and 20-inch wheels on the six. Nineteen-thirteen bodies have been considerably refined, and number 14.

An especial feature on all models is the new cowl dash. This dash is leather-covered over metal, no wood being used. The speedometer, lighting switch, air-pressure gauge, pressure pump, ignition switch, gasoline gauge and horn bulb have all been placed on the extended panel of the cowl, while on the dash proper are the oil-sight feed, carburetor adjustment, starting valve and ventilators.

COLBY

NOTABLE advancement has been made in the Colby models for 1913. Two fours, larger than last year, and a six, announced in December, will take the place of the 1912 models. Model L, which last year had a wheelbase of 116 inches, a motor of 4 1/12 by 4½, with an underslung frame, appears for 1913 as model C, with four cylinders 4⅛ by 5¼, a 118-inch wheelbase, an overhung frame, and 34 by 4½-inch tires, instead of the 36 by 4's used previously. The underslung frame has been abandoned, while the 112-inch wheelbase model has been discontinued.

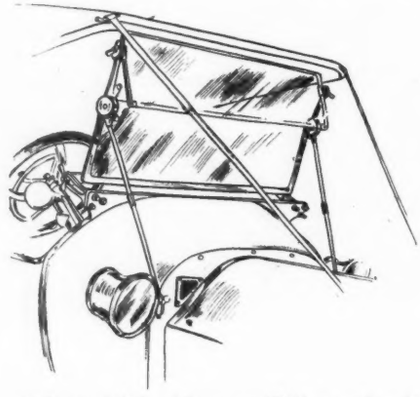
The ignition system is an Eisemann dual, while the Rayfield carbureter has been adopted. The springs, formerly half-elliptic all around, are now three-quarters in the rear and half-elliptic in the front. The gearset, formerly on the semi-floating rear axle, is now a unit with the motor and dry multiple-disk clutch, which replaces the cone clutch of 1912. The rear axle is of the floating type, of pressed steel.

Similar changes have been made in the large car, model H, whose 4½ by 5½ motor, 121-inch wheelbase, 36 by 4-inch tires, multiple-disk in oil clutch, and pressed steel front axle, have been replaced with the model name E, a 4½-inch bore, a 128-inch wheelbase, 36 by 4½-inch tires, a Raybestos-faced dry-disk clutch, and an I-beam front axle.

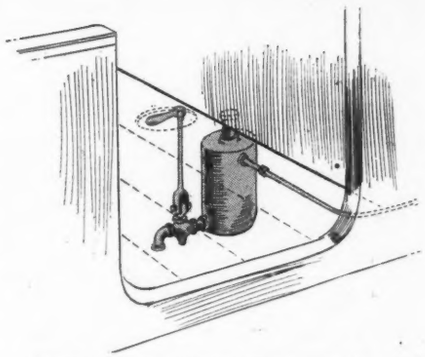
The new six will have a wheelbase of 135 inches, 37 by 5-inch tires, a 4⅛ by 5¼-inch motor, with other features, except as to size and proportion, identical with the four-cylinder models. The Gray & Davis lighting system has been installed in all models, while the six will also have the starting feature. A turbine air starter is used on the four-cylinder models.

CRAWFORD

COMPRISING two chassis models, Crawford cars for 1913 show a conservative development of former practices, with no changes from fundamental features. The models are the 13-30, formerly



Cole is fitted with a ventilating and rain-vision windshield of new design, supported by rods to the lamp brackets



Water in the Chalmers tank settles in a well, from which it may be drained by small handle in the floor

the 12-30; and the 13-40, formerly the 12-35. Most worthy of mention in the modifications of design that have been made is the change from the square-motor fraternity to the new long-stroke brotherhood. Last year's 30 motor was 4⅛ by 4¾, while that of 1913 is 4⅛ by 5¼. Last year's 40 was 4½ square, while this year it is 4½ by 5½, the stroke a full inch longer.

The only other change in the 30 is in the front tires, which were formerly 34 by 3½, but are now 34 by 4, to correspond with the rear tires of the same size. Model 40 has undergone a lengthening of wheelbase from 120 to 125 inches, and an amplification of tires from 34 by 4 to 36 by 4. The rear axle gearset is retained, with the floating-type axle. Body types show refinement and increased comfort.

CHEVROLET

PERHAPS new to many motorists, the Chevrolet car, of Detroit, which is largely an incorporation of the ideas of Louis Chevrolet, former racing driver, has a six-cylinder, 40-horsepower motor of the T-head type. The bore is $3\frac{9}{16}$ inches and the stroke 5 inches. Three-point power plant suspension is used and cylinders are cast in threes. The cooling system makes use of the usual positively-driven centrifugal pump, radiator of special design and fan.

The car uses an 18-inch cone clutch, three-speed gearset and floating rear axle. The rear suspension is on three-quarter platform springs. The gasoline tank is carried under the front seat, feeding by gravity. An English starter, employing a rotary air motor and an air pump connected to the gearset is used. Lighting of all lamps is through the use of a generator which is motor-driven. The car carries full complement of accessories for all needs. The wheelbase is 120 inches.

CUTTING

BEGINNING with 1913, the Clark-Carter company will revolutionize its manufacturing policy in conformance with the modern movement against annual models. Last season six models were offered by this concern, half of which number were brand new models. This year but one

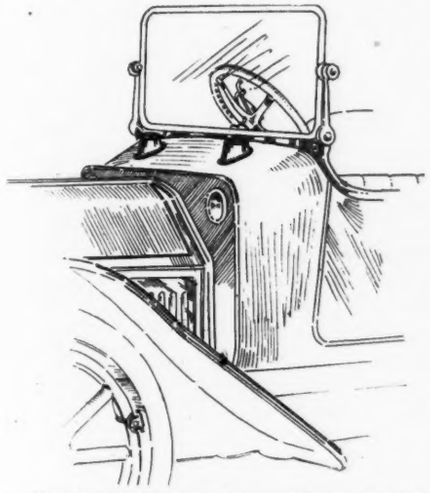
chassis will be produced, with two body styles. This model will embody principally typical Cutting characteristics, and will be made in greater numbers than has heretofore been possible with the manifold models of yesteryears.

The adoption of a unit power plant and three-point suspension are notable developments of design that are brought out in this model. No sub-frame is used, the motor being hung on the chassis frame direct. The new motor is a block casting of four cylinders, 4 by 5, with valves on the left side, and inclosed in cover plates. The multiple-disk clutch will have twice the number of plates formerly used. Right-hand drive and control is used, with the levers inside the body. Cross-bar brake-eveners are used. This chassis has a wheelbase of 120 inches and 36 by 4-inch tires all around. Interchangeable roadster and touring bodies are fitted, and the car is sold with complete equipment.

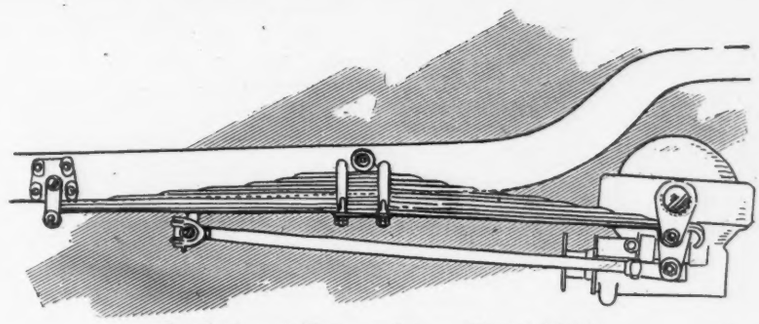
CUNNINGHAM

A SINGLE Cunningham chassis will be built for 1913, as formerly. Unlike previous models, however, the new car will be steered from the left side and the levers will be located in the center. Tires will hereafter be carried in the rear on a special tire bracket. The fuel tank is located at the rear of the car below the chassis springs, pressure fed to the carbureter, instead of the gravity feed from the tank under the seat formerly used. In other respects there is very little difference in this and former production. The cylinder sizes, 4¾ by 5¾, remain unchanged, and the valve-in-the-head feature is retained.

Electric lights and starting are supplied with this car, the current being furnished by an engine-driven dynamo. Body types on the new cars are a runabout and a touring car, limousine, landaulet and berline limousine, respectively, each of seven passengers. Bodies for 1913 have been improved, concealed door hinges and handles with absence of screws on mouldings being the special features. Upholstery has been



New Cartercar dash with gasoline tank, windshield and side lights in a unit, the two projections on the cowl are a filler and gasoline gauge



Lanchester cantilever spring on Edwards-Knight

deepened and a special windshield fitted, upon the filler board of which is mounted the speedometer, gauges and all accessories. The equipment includes demountable rims with two spares, top, envelope, speedometer, etc.

DAVIS

CONTINUING model 40, in series A, the Davis announces a new model, larger than the first. Model 50 A is built along very similar lines to the 40 A, but employs a 50-horsepower Continental motor. The older model shows several improvements over the original design. The wheelbase has been lengthened from 112 inches to 118 inches, and the equipment amplified by the addition of a Gray & Davis lighting system, with a Disco starter, with option of the Gray & Davis starter. The new 50 A uses a Continental 4½ by 5½ motor, with cylinders cast in block. It otherwise is identical with the smaller car. The Schebler carbureter has been replaced with a Stromberg for the 1913 season. Bodies include five-passenger and four-passenger touring bodies and a two-passenger roadster with a streamline rear deck.

DORRIS

FOR 8 years the Dorris car has been developed in a logical series, without a radical change in features. The 1913 model H is substantially the same car as was produced as much as 5 years ago, but nevertheless it is thoroughly up to modern standards. This car is notable more for its steadfast continuations of characteristic features than for any difference in detail. At the same price at which it always has been marketed, the Dorris retains the valve-in-the-head motor, 4⅜ by 5, with cylinders cast separately, and suspended from the main frame at three points; the dry multiple-disk clutch; the three-speed selective gearset located amidships; straight-line shaft drive; and floating rear axle.

Changes are a lengthening of the wheelbase by 6 inches, making it 121 inches; refinements in the valve-action that make for silence; a sight-feed in the lubrication system, and the addition of the Apleo electric lighting and starting system. An entirely new set of bodies has been provided for 1913 custom, built in the modern flush panel style, with wide doors and a moderate cowl with integral windshield. Body types include four, five, six and seven-passenger types, with complete equipment, including top, envelope, speedometer, windshield, extra demountable rim

A feature that is notable, although not new, is the speedometer drive. This drive is not from the front wheel, but from the transmission shaft.

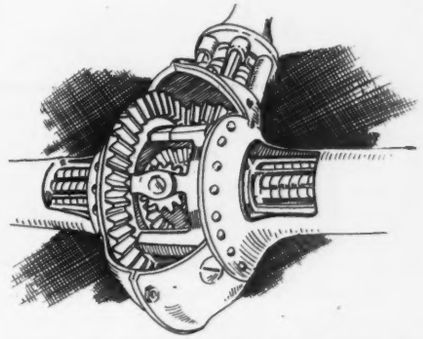
DETROITER

EVERY thousand cars turned out by the Briggs-Detroiter factory constitutes a new series, regardless of the year or season. Changes, such as experience shows to be advisable, are made series by series, instead of issuing new models annually. The only changes that have been made in the second series, which have been on the market for about 4 months, are minor refinements, such as steel stampings to take the place of castings at several points, and a general paring down of weight, where it can be done without sacrificing strength, by the use of better adapted materials.

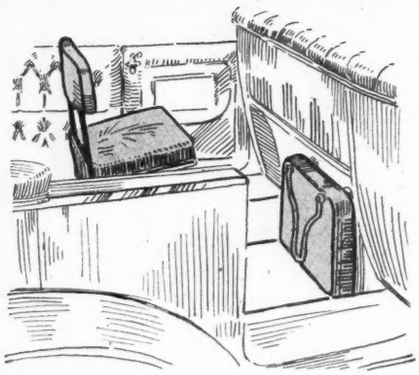
Briefly, the Detroiter is an exponent of long stroke, block motors in a unit with the flywheel, clutch and gearset, floating rear axle, platform springs, inclosed valves, fixed spark and left-hand steer with center control. The Detroiter is offered with three sets of equipment, affording the purchaser the advantages of manufacturers' equipment prices, but enabling him to economize on equipment if he desires.

EMPIRE

LARGER, more powerful and more complete in every particular, the Empire car appears for 1913 in model 25, a big brother to the former 20. This model was



A heavier pressed steel differential housing is used in the rear axle on Ford



Limousine-type disappearing auxiliary chairs used in Flanders six

announced early in June. The design embodies the features of a full-inclosed unit power plant, with cylinders cast in pairs, 3½ by 4½ inches, bore and stroke. The valves are all on the left side, their mechanisms inclosed in cylindrical individual housings. The crankshaft is supported on three bearings, and lubrication is by the circulating-splash system. Fixed adjustment is used in the K-W high-tension single ignition system. Thermo-syphon cooling is employed. The car is steered from the right side, and the control lever is in the center. A five-passenger touring body, with fore doors, is fitted.

ENGER

MODELS F, J, and E of Enger cars are continued, while a new model, P, has been announced as new for the present season. The new model differs little mechanically from models F, J, and E, using the same 4½ by 5¼ motor, with its valves arranged on the left side with inclosed mechanisms. An especial feature is the means of closing the valve chambers. The cylinders are cast in pairs, and the valve-chamber of each pair is covered by a single plate which carries the spark plugs and pet-cocks, and which, when removed, permits ready accessibility to the valves. Multiple-disk clutches, three-speed gear-sets, and three-quarters floating axles are used on all models. Model P is fitted regularly with the Northeast electric lighting and starting system, all models being equipped with a top and envelope, windshield, speedometer, horn, and tools.

EDWARDS-KNIGHT

ONE of the newest American cars is the Edwards-Knight, which was announced less than a month ago and described in detail in these columns December 12. In addition to using the Knight two-sleeve motor, the car has numerous other constructions, many of which are incorporated in the latest European models. Among these details are detachable wire wheels with Q-D rims, with wood wheels optional; and Lanchester type of rear spring in which the weight of the spring is carried on the frame and so reduces the dead weight of the axle.

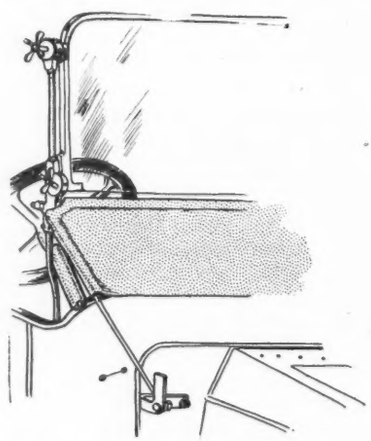
The motor has a new non-splash forced-feed system of oiling in which the throttle controls the oil pressure, which ranges from 2 pounds with practically closed throttle to 20 pounds with the throttle open. It is one of the few cars to use forged connecting rods of round section with the insides drilled out to reduce weight, leaving a wall thickness of ⅛ inch. The U. S. L. electric flywheel starter is fitted, and the motor carries a Simms magneto and S. U. carbureter. In the transmission system the dry-disk clutch and gearset are carried in the gearbox in separate compartments.

The rear axle is worm-driven with the worm underneath, yet affording an axle clearance of 9.25 inches. The axle is a Timken construction fitted with worm and worm wheel made by David Brown, of England. It is a straight type worm carried on Timken rollers, which bearings also take up end thrust. The car has straight-line drive in that both motor and gearbox are mounted to decline rearward at an angle of 4 degrees so that with the car loaded the crankshaft, gearset shaft, propellershaft and worm shaft align. The propeller shaft has two universal joints, two radius rods take the driving action of the rear axle, and in addition there is a torque tube. The frame has a deep drop in the middle to bring the center of weight lower, and it is narrowed in front to allow of short turning.

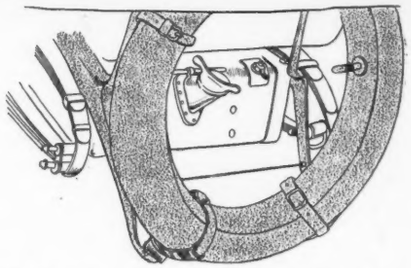
Various body types are mounted on the same 120-inch chassis. It has left-hand steering and center control.

FORD

BODY lines, details of equipment, and a slight alteration in the rear axle housing are the only changes that have been made in the Ford for the 1913 market. A great increase of production is planned over the already enormous output of the Detroit plant. This permits a substantial reduction in price. The bodies are improved, the slant of the footboard and the line of the rear seat-bottom being no longer visible from the outside. The new bodies are of the flush-side type, with simple vertical moldings to mark the doors. The former break at the rear has been eliminated and replaced with a continuous curve from the top of the seat-back to the frame.



Ventilating windshield on Franklin is supported on lamp bracket and has leather apron



Flanders rear system, showing gasoline tank, filler and tire bracket

The new body sits slightly lower than former types, and the windshield is now supported by backward extending braces instead of the long rods over the hood. A new carbureter hot-air fitting has been added to the engine, and the rear axle has been changed slightly, the differential housing being made slightly heavier than it formerly was. The body types for 1913 are the same as last year, except that the three-passenger roadster has been dropped. The new roadster has a wide turtle back instead of the gasoline tank formerly carried in the rear.

FALCAR

NEW alterations have been made in Falcars. Electric lighting will be provided as regular equipment, the current being drawn from an Elgenac generator and storage battery, instead of from an externally charged battery, as in last year's cars. This system will furnish light to all five lamps instead of to the side and tail lamps only, as previously. Starters will be applied where specially ordered. Body designs have been improved on all except the speed model. The other features remain practically unchanged from former practice.

FLANDERS

FOR the coming year the leader of the Flanders Motor Co. will be its model 50-six, which, although of the same cylinder dimensions of 4 by 4¾ inches bore and stroke, respectively, as the Everitt six of last season which it succeeds, may be really regarded as a new proposition so many changes having been made in it. The Flanders company will confine its energies exclusively to the manufacture of sixes, and has added a smaller companion, known as the 40-six, to its other model. The Everitt four-cylinder car has been dropped.

The little six has a bore of 3⅝ inches and a stroke of 4½ inches. On this chassis a five-passenger body is mounted, while the larger car may be had with either a seven-passenger touring body or a four-passenger touring roadster body. Motors are monoblock-cast and present a very compact appearance.

Mechanical features are all in accord with advanced ideas in mechanical construction, although there is nothing rad-

ical. The Gray & Davis electric lighting and starting systems are fitted as standard equipment on both models. With this make of apparatus the generator and motor are separate. Equipment on both cars is the same, being most complete in every respect.

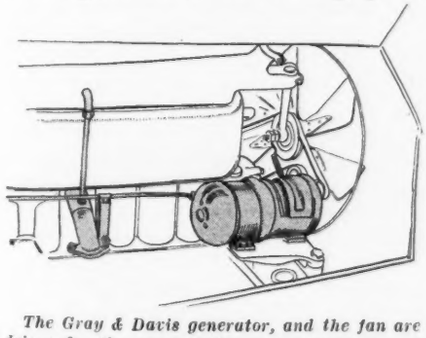
A special feature of the six-50 seven-passenger body is the new type of disappearing auxiliary seats, which when folded down into a recess in the back of the front seat are entirely out of sight and out of the way. Bodies conform to the latest dictates in motor car fashions, being of the flush-sided straight line design. The four-passenger type presents an exceedingly rakish appearance. Drive and control are on the right.

FRANKLIN

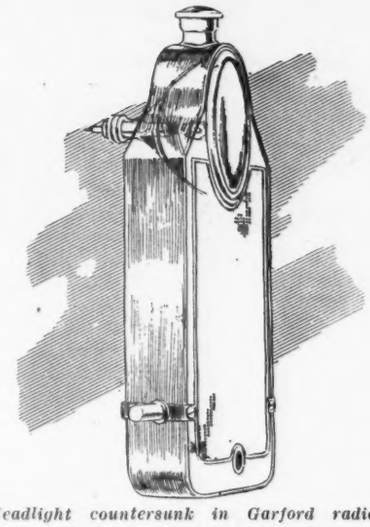
UNDER the series production plan, the Franklin makes no announcement of 1913 models. The second series of Franklins was announced early in the fall, while deliveries on series three started in December. The six-cylinder model H of 38 horsepower, model D of 30 horsepower and the 18-horsepower four-cylinder model G, all continuations of several seasons, and model M, a light six of 25 horsepower brought out a year ago, constitute the Franklin series 3. A victoria phaeton of the English style has been added to the list of bodies fitted to model D.

A new feature of the limousines is a dust-proof screen in the front window, back of the driver's seat, permitting ventilation of the car without admitting dust. A feature original with series three consists of an electric lighting and starting system of strikingly simple composition. This starter, which is of Franklin manufacture, consists of a motor-generator geared to the motor by a silent chain, which below certain speeds is a motor, turns the engine over, and at speeds above this the counter electro-motive force reverses the direction of current flow, converting it into a generator.

No accessory devices are used to produce this, it being an inherent feature of the winding employed. It is controlled by a single switch, which, if left in the starting position, makes stalling of the motor impossible, for if the engine speed falls below 300 revolutions, the generator becomes a motor and cranks the engine, but at all speeds above this is charging the battery. A single double-throw switch controls this and the ignition, which is automatically governed. Eighteen volts are used in this system and in the lighting. The four elliptic springs, wood frame, air cooling, tubular front axle, and propulsion through the springs are retained as cardinal features.



The Gray & Davis generator, and the fan are driven by the same belt on the Flanders six. Intake pipe extends between middle cylinders



Headlight countersunk in Garford radiator, which is supported on trunnions

FIAT

THE American as well as the foreign Fiat is built in three chassis models, the parts in the American factory being made from the foreign drawings and superintended by foreign engineers so that the domestic and foreign models are duplicates in respect to design, materials and workmanship. To the four and six-cylinder models of last year a large four has been added which coincides in nearly every respect with its two predecessors.

These chassis are characterized by block cylinder castings with a transverse front end shaft to drive the magneto and oil pump; four-speed gearbox and combined pressed steel rear axle and torque tube, in which two stampings constitute the entire housing, these two being specially light, their total weight in the rough being but 80 pounds. The motor has a forced-feed non-splash oiling system, supplied from an exceedingly compact gear pump mounted on the rear end of the camshaft and delivering its oil through a large diameter conduit incorporated within the crankcase when cast, from which conduit the three crankshaft bearings are supplied.

The crankshaft throws and crankpins are drilled and the connecting rods carry copper tubes to convey the oil to the wrist pins. The exceedingly compact four-speed gearset is a Fiat feature, the total length between bearings being but 10 inches. The new four has a compression release fitted. All models carry electric lights, but engine starters are not listed. For the first time all Fiat models have the full-dinner-pail equipment, which includes everything that the owner requires.

These chassis are internationally renowned for their clean cut appearance; every detail has been designed for its duty and place and looks the part. An example is carrying the magneto control through the crankcase from front to rear thereby eliminating unseemly connections and giving more fool-proof control. Another example is the clean-cut block casting, with enclosed valve springs and abbreviated manifolds and water connections.

GLIDE

EXPONENTS of few models and of large cars for many years, the Bartholomew Co., maker of the Glide car, has signified a change of policy as well as design and prices. The most notable among the first are in the engine and transmission systems. The new motor is cast in block, instead of singly as in former Glides; the valves and control are on the left, instead of on the right, and the gearset is a unit with the motor instead of with the rear axle. The cylinder bore has been decreased, and the stroke lengthened. A floating rear axle is used for the first time, and a starter, electric lights and a full equipment are included.

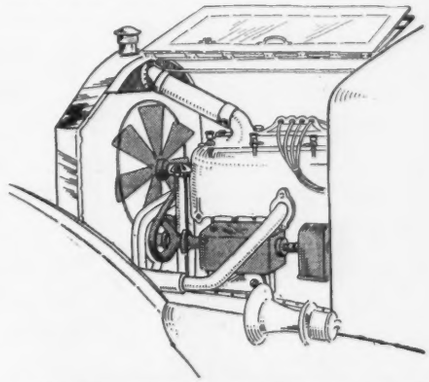
The new car is smaller than former Glide productions, having a wheelbase of 118 inches, tires 34 by 4 inches all around. These dimensions will be appreciated when it is recalled that formerly these dimensions were 120 inches and 36 by 4½ respectively. The weight has been greatly reduced, and the frame dropped to lower the center of gravity.

A new feature is the use of two pumps in the circulating-splash oiling system. While the multiple disk clutch is retained, it has been changed from the old disk-in-oil type to the dry-plate form. The dash fittings have, with the exception of the speedometer, been countersunk in the dash. Two body types are fitted, a touring and roadster.

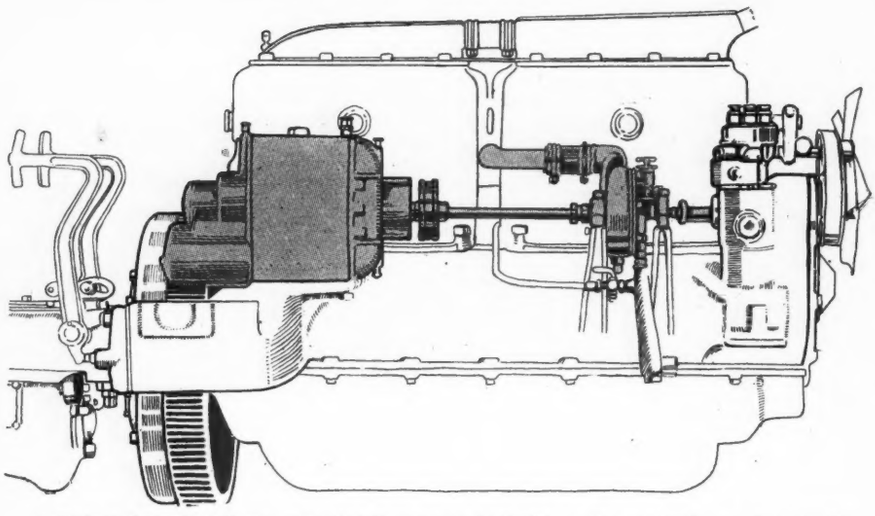
Model 45, the seven-passenger car continues the former Glide practices, and is being turned out in small numbers. The new model is the feature of the line.

GARFORD

SIXES only are announced for 1913 as the Garford line. Two models are offered, model S 14 and G 15. Model 14 is the outgrowth of the 1912 model G 14, while



The fan, generator, and magneto are all driven from the same shaft on the Henderson. The oil breather and filler is accessible



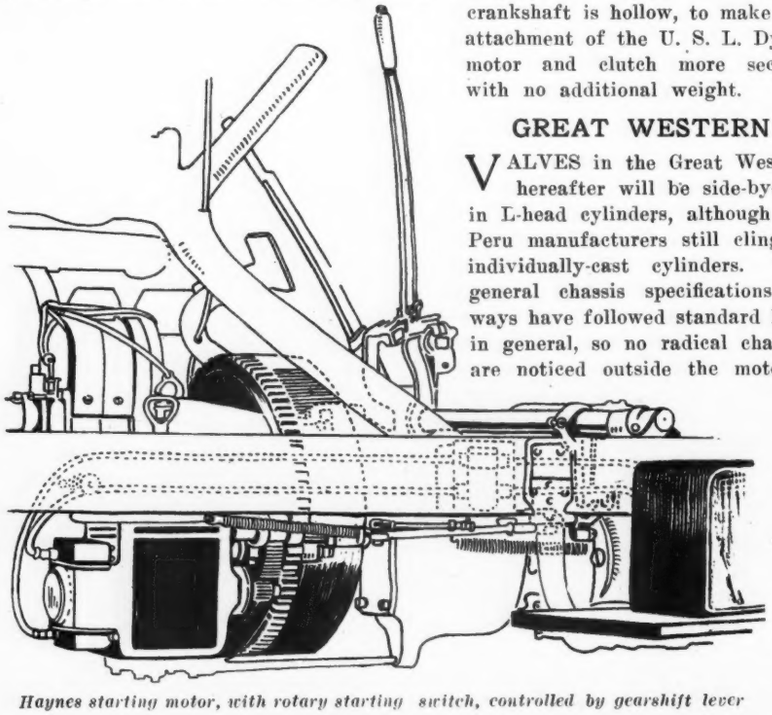
Hudson-Delco installation, showing how pumpshaft drives the generator and separate ignition distributors

model G 15 is a newcomer. Model 14 differs from its predecessor only in that the Bosch dual ignition has replaced the double system used last year. The new six is a small edition of the older model, embodying many original features and practices that are new with the garford car. Principal among these is the unit power plant, with the clutch, gearset and motor in one assembly. Another is the adoption of a radical bore-stroke ratio, viz.—3¾ by 6, a ratio of 1 to 1.6. Still another is the casting of all six cylinders in a single monoblock, while perhaps the most noticeable is the single headlight incorporated in the radiator, where it is protected, shines on the middle of the road, and presents a very neat and finished appearance. The new radiator is supported on flexible trunnions.

The L-head type of valve placing is retained, although the valves are situated on the right side instead of the left, as in the larger six. Another departure is in the use of single ignition, made practicable in so large a motor by the installation of the U. S. L. electric starting and lighting system. The gasoline tank feeds to the carbureter by pressure in the new model. Platform springs have been abandoned in this car, in favor of the three-quarters elliptic type, and four crankshaft bearings are used instead of three as in the large car. Tires are 36 by 4½ all around, instead of different sizes back and front. The front axle on the new model is dropped outside the spring-seat but extends from thence in a straight beam. Another new construction is curved cranks. The two double cranks next the ends are forged on a curve which adds strength, and permits them to be made thinner than would be advisable were they straight. At the flywheel end the crankshaft is hollow, to make the attachment of the U. S. L. Dynamotor and clutch more secure, with no additional weight.

GREAT WESTERN

VALVES in the Great Western hereafter will be side-by-side in L-head cylinders, although the Peru manufacturers still cling to individually-cast cylinders. The general chassis specifications always have followed standard lines in general, so no radical changes are noticed outside the motor.

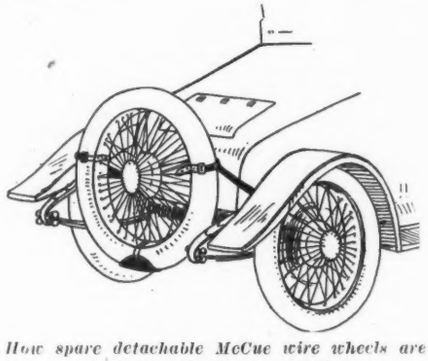


Haynes starting motor, with rotary starting switch, controlled by gearshift lever

In connection with the moving of the valves to a position where they may be operated directly by push-rods, their mechanisms have been inclosed. Roller lifters are employed, thus assisting the valve inclosure in minimizing valve noise. The cone clutch has been varied as to angle of face to make its engagement more gradual, and flat springs have been inserted under the leather, to cushion the engagement. The wheelbase shows an increase of 4 inches over that on 1912 cars, being at present 118 inches. Body types include a low-seated and dip-sided roadster, a five-passenger touring body, which is roomier than last year, and a sedan coupe.

HAYNES

HAYNES cars are to be made in two sizes of chassis for the season of 1913. Last year three models of Haynes cars were produced, but for 1913 only two are offered. The model retained is model 21, this year model 22; a larger and smaller model, respectively, carried last year having been dropped. Model 22 is a better car in many ways than model 21, although with the same long-stroke, T-head, four-cylinder motor, and liberal wheelbase..

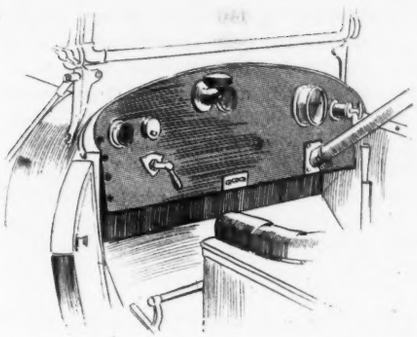


How spare detachable McCue wire wheels are carried on Henderson roadster

The new car, model 24, announced in December, is an L-head production, 4¼ by 5½, with left-hand steer and control, similar in general features to model 22. The most interesting feature is the new electric starting and lighting system. An electric generator with a storage battery as reserve supplies the current. The generator is gear-driven from the engine, while starting is accomplished by a separate motor, geared to the toothed flywheel.

An especial feature of this system is the simple two-wire connections to the generator and motor, and the efficient and durable series plan of battery connection. The system operates on 12 volts, the 6-volt lamps being supplied on the three-wire plan. Other improvements include lengthened springs, a lowering of the frame by 2 inches, a new and accessible oil-pump location, and a new spring-hanger for the three-quarters elliptic springs.

The body lines have been greatly improved, all useless panel work on the sides and doors being removed, lending the car a grace that comes of form rather than



Jackson dash, showing fuel tank filler and dash fittings

decoration. The lines are very clean, and the proportions of the body have been enlarged. The front mudguards have been improved in appearance.

HAVERS

ADHERING to its practice of producing sixes exclusively, the Havers Motor Car Co. announces a new model larger than last season's which will be marketed in addition to the continued six-44. The new model, styled the six-55 has its cylinders 4 by 5, cast in pairs, with valves on the left side. Valve mechanisms are inclosed by aluminum cover-plates, and there are four main journals. The circulating splash lubricating system is employed, and thermo-syphon cooling. Model six-55 has undergone no noteworthy changes except small mutations of detail. As in last season's production, two body types are fitted to each chassis, a touring and roadster type. Model six-55 uses the Northeast electric starting, lighting and ignition system, while the smaller car uses an acetyline starter and lights, and Bosch magneto ignition. Especial attention is called to the Knickerbocker speedster, the six-55 runabout.

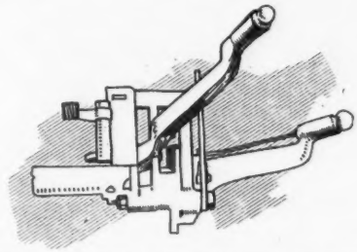
HUDSON

WITH the Hudson 33 discontinued, and two larger models produced, one of which is a six, the Hudson company signals it progress from the low-priced field into the realm of medium prices. The new six, model 54, was announced in August. The motor of this car consists of two cylinder blocks of three cylinders each, with a unit motor and gearset. The valves are all on the left side, and the cylinders measure 4⅛ by 5¼, the preponderance of stroke placing its actual horsepower at 54, as against the S. A. E. rating or 40.8.

The car has a wheelbase of 127 inches, tires 36 by 4½, a dry-disk clutch, and a three-speed gearset. The large four, known as the 37, after its brake-test horsepower rating, is similar in design to the 54, except that it has but four cylinders, cast in block. The same cylinder dimensions obtain, and general characteristics of design. The 37 has a wheelbase of 118 inches, tires 36 by 4, and the same chassis features as the six. Both cars are equipped with the Delco starting, lighting and ignition system. The system is alone relied upon for ignition, the distributor being mounted separate from the motor-generator. The latter is driven by the timing gears, and drives through a reduction to the toothed flywheel, which is left exposed in the unit power plant for this purpose. The body types resemble those of the six, except in proportions.

HERRESHOFF

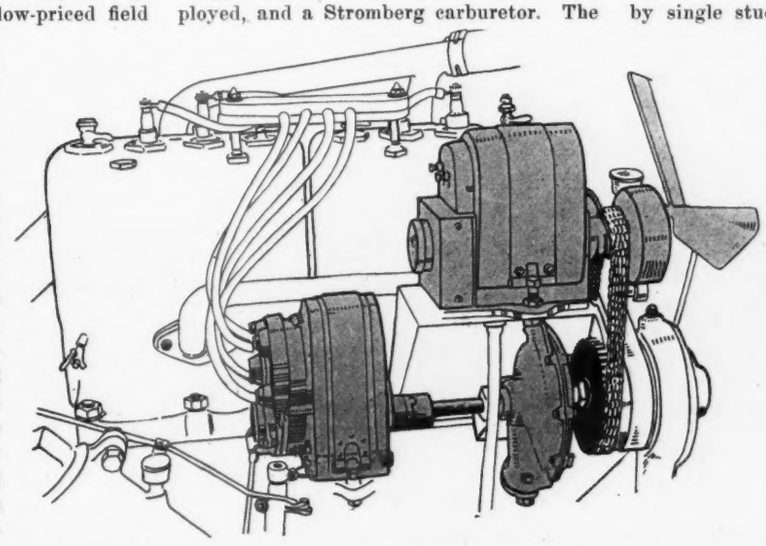
SAID to be the smallest six in America, the new Herreshoff six-36 makes its debut in the 1913 market. The car is accompanied by a new four, which follows closely the features of design brought out in the six. Both cars are provided with



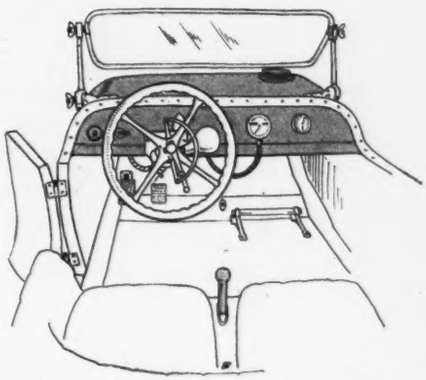
Control quadrant with fifth gate for starter operation

motors of the T-head type, unusual in cars of such small size. The cylinders are cast in one piece, 3⅜ by 4½, with the intake valves on the left side and exhaust valves on the right. A circulating splash system of lubrication is used, with a sight-feed on the dash. These motors are cooled by water on the thermo-syphon plan, a vertical flat-tube radiator and fan being employed.

Fixed ignition by means of a dual Briggs magneto and storage battery is employed, and a Stromberg carburetor. The



Interesting grouping of pump, magneto, generator and propeller fan, to drive from one shaft on the Jackson Majestic



Henderson gearshift control between seats, and cowl dash tank, with flush fittings

clutch is of the multiple-disk-in-oil type, which, with the four-speed gearset and flywheel, are included in an extension of the crankcase. Shaft drive to a semi-floating rear axle is used. Especial features are platform rear springs, demountable rims, and an electric lighting and starting system, furnished by the Westinghouse company. Left-hand steer, with center control is used on both models, the emergency brake being pedal controlled, and the clutch pedal controlling the service brake. Both models are supplied in touring and roadster types.

HENDERSON

ORIGINALLY brought out last spring as 1913 models, the Hendersons will not differ materially from the original production, except that an electric starting system is being installed in the rest of the present series, instead of the acetylene starter with which they were originally equipped.

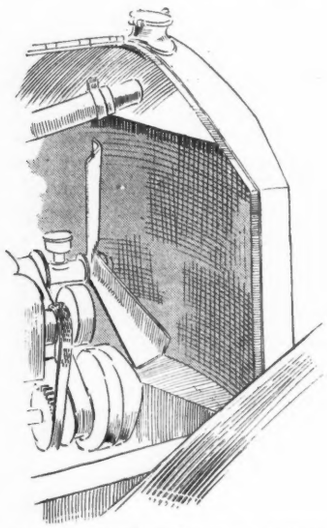
This car is built upon a single chassis, with two body styles, a roadster and touring car respectively. The roadster is known as model 44 and the touring car as model 46. The motor is of four cylinders, cast in block, with valves on the right side. The valve mechanisms are inclosed beneath two cover-plates, secured by single studs. Ignition is by a Remy magneto, which is driven from the same shaft that drives the Ward-Leonard generator. The carbureter is a Schebler, fed by gravity from the dash gasoline tank. A leather-faced cone clutch is used, and shaft drive with a single universal to the Stutz rear system.

This system is familiar to most motorists, and may be briefly described as a rear axle gearset, the countershaft being suspended neath the main shaft. The housings and axle tubes are built up of cast members. Brakes are side-by-side in very wide drums, and the rear axle proper is

of the pressed steel three-quarters floating type.

The Ward-Leonard system of electric lighting and starting is used, the system consisting of two units, the generator being driven by the magneto shaft, and charging a storage battery, and the starting motor geared, in action to the toothed flywheel. The control is by a lever, convenient to the driver, which through a cushioning spring progressively completes the starting circuit through a resistance, such as permits the motor to turn slowly, meshes the gears, and closes the circuit direct. When the engine responds, the spring returns the mechanism to its original position, drawing the motor gear from mesh and opening the circuit.

Steering is on the left side, with the spark and throttle levers mounted on top of the wheel. The left pedal controls the



Back side of D-type radiator on Jackson Sultanic

clutch and service brake, while the right pedal actuates the emergency brake. A small handle, projecting between the seats controls the gearset, having a vertical gate-change, instead of the conventional horizontal system. A feature that is worthy of especial note is the option offered of either wire or wood wheels.

HUPMOBILE

AN ADDITION to the Hupmobile line that is most notable is a six-passenger car, with a wheelbase of 126 inches. This model carries the same motor as model 32, with its wheelbase of 106 inches, continued from last season, practically without change. Minor improvements are to be found in the body lines, and trimmings are black and nickel throughout.

The same features of the unit power plant, the long stroke and small bore, 3¼ by 5½, with cylinders cast in block, the multiple-disk clutch and three-speed selective gearset, the floating rear axle and the low center of gravity, are all retained. Tires are 32 by 3½ on the roadster and four-passenger car, 32 by 3½ on the coupe and 33 by 4 on the six-passenger product.

The Hupmobile 20 is no longer produced, the entire energies of the Detroit factory being devoted to the production of the long-stroke 32.

INTER-STATE

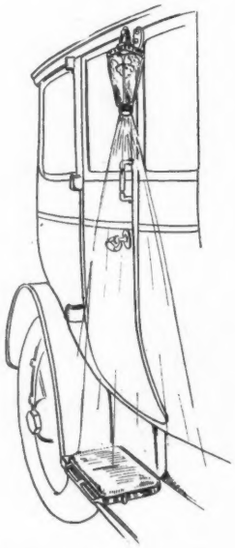
INTER-STATE cars appear for 1913 in stead of the three fours produced last year. The new model follows former precedent in design very closely, with only such departures incorporated in its make-up as experience has shown to be expedient. Like the fours, the six-45 motor is cast in block, with all valves on one side, their mechanisms inclosed by light cover-plates. The bore is 4 inches and the stroke 5 inches.

The flywheel incloses a new dry-plate clutch that is used on the new car instead of the former disk-in-oil type. The gearset is a unit with the flywheel and motor, and provides four speeds instead of three as formerly. Direct drive is on top speed in this model, and control levers have been moved from the right to the center of the car, to bring them within reach with the left-hand drive now employed. A Mea magneto is installed as an accessory to the Apleo electric lighting, starting and ignition system, whose use is continued with minor improvements. The wheelbase of the new car is 132 inches, and the tires 36 by 4½. Three-quarter elliptic springs are used in the rear, and ball bearings are used throughout the transmission and axles.

IMPERIAL

FOUR models of Imperial cars are offered for this season, built on three chassis. The first of these, model 44, furnished in a touring car type, is very similar to model 44 of 1912, except that the cylinder sizes have been enlarged from 4½ by 5¼ to 4¾ by 5¼, and is now equipped with an electric starting and lighting system. It has furthermore been lengthened in wheelbase by 2 inches, being now 122 inches.

Model 34 differs in the extension of the

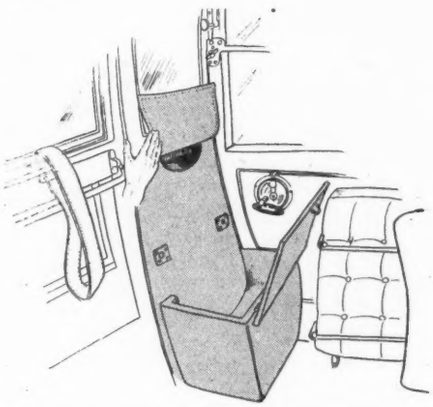


Hudson limousine features continuous body lines, concealed frame, and door mat

wheelbase from 116 to 118 inches and the motor size has been enlarged from 4 5/16 by 5¼ to 4½ by 5¼, and will also be provided with an electric starting and lighting system. Models 32 and 33, touring car and roadster, respectively, on the same chassis, will have a floating axle instead of the former semi-floating type, a motor 4 by 5½ instead of 4 by 4⅛, and tires 34 by 4 instead of 34 by 3½ inches.

JACKSON

REDUCED from a line of five models in 1912, the Jackson is offered for 1913 in three separate chassis, one of which is a six. This is the first Jackson six, and adds one more to the increasing numbers of moderately priced light sixes. The motors for the season just opened are all new, the former practice of equal bores and strokes having been abandoned in favor of the long stroke. The overhead valves also have been abandoned, 1913 motors being of the conventional L-head type, although the four elliptic springs, always associated with Jackson construction, have been retained.



Safe under seat, auxiliary seat and pocket in side of Haynes coupe

The three models are the Olympic, Majestic and Sultanic. The Sultanic is the six. It has a wheelbase of 138 inches, tires 36 by 4½, on demountable artillery wheels. The six-cylinder motor has cylinders 4⅛ by 4¾, cast in pairs. Silent chain-timing drive is employed, and the vlaves are side by side, on the left side of the motor. A low-tension dual system of ignition is employed, in connection with an electric starter and electric lights. A spare wheel is included as regular equipment, together with a top and boot, windshield, speedometer and electric horn. The Majestic is of four cylinders, 4½ by 5¼, cast in pairs, with valves on the left side. The Olympic is without electric lights, but is equipped with a Disco starter. These models are similar in design, although less elaborately equipped.

KING

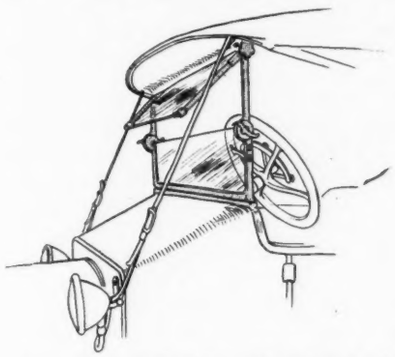
IN addition to its present four-cylinder type the King Motor Car Co. will place upon the market another four-cylinder model, the features of which are somewhat of a departure from those incorpo-

rated in the model 36. The spring suspension of the King, which has always been a distinctive feature, is absent in the new car, which has three-quarter elliptic rear springs and semi-elliptic front. The 36 makes use of half-elliptic rear springs which are mounted with the reverse side up as compared with the conventional construction.

Drive through torque tube appears on the new creation as well as on its older running mate. Cylinder dimensions of the 36 are $3\frac{13}{16}$ inches bore and $5\frac{1}{8}$ inches stroke. This motor has an L-head design and is monoblock cast. Dimensions of the new motor and the type of design had not been definitely decided upon at the time of going to press, but the car will have greater power than the model 36. Prices on the new touring car vary slightly with the equipment.

KRIT

KRIT cars will appear on one chassis. Heretofore there were two models, one of 96 inches wheelbase and the other 106 inches. The shorter type has been discontinued, as has the underslung type which was known as model U. Few



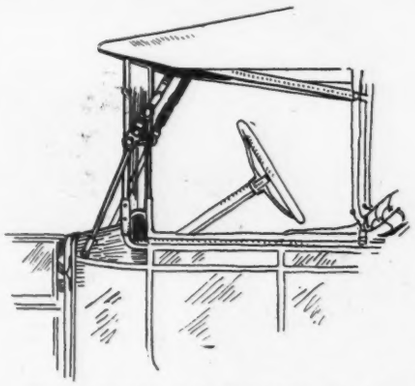
Deep cowl on Hudson, with integral windshield, no brace-rods used. Top straps secured behind bonnet

changes have been incorporated in the cars for the coming season, although minor refinements may be noticed on close inspection. In the main, however, the cars still have the Krit earmarks.

The motor of $3\frac{3}{4}$ inches bore and 4 inches stroke has been continued. It is a four-cylinder monoblock L-type, with valves on the right. Cooling is by thermo-syphon; ignition is by the use of magneto only; lubrication is by splash; gasoline is fed by gravity. The principal chassis details involve multiple-disk clutch, shaft-drive, elliptic rear springs, selective three-speed gearset located amidships, and drive through torsion tube. The drive and control are on the left. Bodies fitted are a roadster and a five-passenger touring car.

KLINEKAR

FOUR models of Klinekars are announced, as in 1912, which in reality consist of six chassis, the runabout models of the six-cylinder chassis having different wheelbases and steering column rakes from the touring models, and smaller tires. The

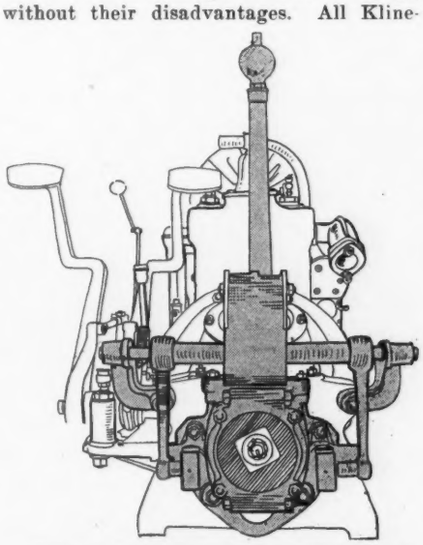


The windshield of the Inter-State six is supported by short braces on the cowl, and in turn braces the top

character of the line is the same as last year, and comprise two fours, the four-30 and four-40, and two sixes, the six-50 and six-60. As the manufacturers of these cars operate on the series plan, these simply are designated as series A, to distinguish them from the models of a year ago. A feature that is entirely new to the American industry is a new convertible coupe body, which combines in one, a torpedo roadster and a colonial coupe.

Unlike many attempts that have been made in this line, this body reveals its feature in no way, as neither type departs in any particular from the conventional appearance of either type of body. Mechanical changes include inclosed valves on all models, a Rushmore dynamo lighting system, the Ever-Ready mechanical starter, modifications in spring and tire sizes, the substitution of cork inserts for the former spring inserts in the clutches, and an auxiliary helper spring on the rear springs.

A notable feature, exclusive with the Klinekar, that is worthy of recalling is the individual-multiple cylinder construction, each cylinder being a separate casting, with open ended jackets. These units are bolted together, with gaskets between, and steel plates on the ends. This affords most of the advantages of block castings, without their disadvantages. All Klinekars have four-speed gearsets and full equipment.



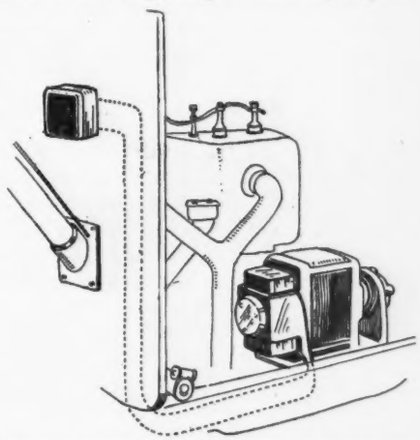
Baby six Herreshoff has compact left-hand center control for unit power plant

A full line of bodies is supplied on these chassis.

KEETON

UNDER foreign license, the Keeton, one of the two cars that are outgrowths of the former Croxton-Keeton company, appear in two models following French practices in design very closely. The two chassis are very similar in characteristic features of design, differing in size and number of cylinders. The Keeton six features a dynamo electric lighting system, optional wood or wire wheels, and a wheelbase of 131 inches. The cylinders of this model are cast in pairs, $3\frac{3}{4}$ by $5\frac{1}{4}$, with valves arranged on the left side, with inclosed mechanisms.

The crankshaft is supported on three bearings, and ignition is fixed. The clutch is of the multiple-disk type, and the gearset, carried amidships, provides three speeds, selectively controlled by a single center lever. The propeller shaft is inclosed in a torsion tube, and drives a rear axle of floating design. Internal expanding brakes on separate drums are provided, each set controlled by pedals, the clutch and service brakes being operated by the same pedal. The motor is carried under a closed sloping hood, with the radiator placed at the front of the cowl dash, with thermo-syphon circulation.



Haynes generator, with simple two-wire connection to automatic cut-out

The four-cylinder model follows the same lines as the six, except that the cylinders are cast in block, with manifolds integral, and a bore and stroke of 3.74 by $5\frac{1}{4}$. Gas starters are employed on both models. Left-hand drive is employed in both chassis, while five-passenger, two-passenger, and coupe bodies are provided for each model.

KISSELKAR

INTRINSIC features of the Kisselkar line remain unchanged, although modifications in dimensions have been made. As in former years four models are carried, embracing three fours and a six. These are of 30, 40, 50, and 60 catalog horsepower, respectively. Each motor is of the

L-head type, with cylinders cast in pairs. The valves are on the left side, with their mechanisms inclosed, and with silent chain camshaft drive, as a new feature.

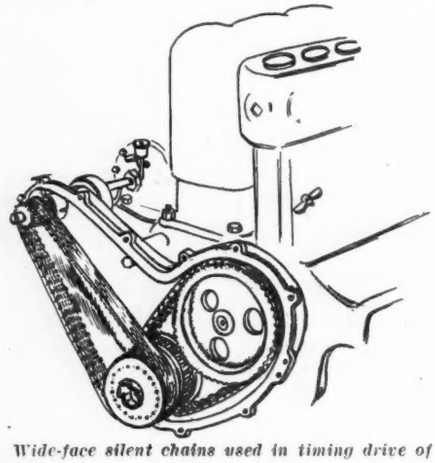
The principal changes comprise an electric starting and lighting system; drilled pistons to drain oil; an increase of stroke in the 40 from 4¾ to 5½ inches, which places one more manufacturer among the exponents of long strokes; an increase in wheelbase on the 40 from 118 to 121 inches, on the 50 from 124 to 132 inches, and on the 60 from 132 to 140, allowing more body room; the use of a four-speed gearset on model 40; and a lowering and refinement of the bodies. Touring, semi-touring, runabout, semi-racing, limousine, and coupe bodies are supplied for all chassis models. Full equipment, including demountable rims, spare tire carriers at the rear, mohair top and envelope, electric lamps, spare rim, speedometer, and electric horn.

The new bodies are lower, wider and longer than the former designs, the seats are closer to the floor and more inclined, and the side-panelling has been simplified, which improves the appearance.

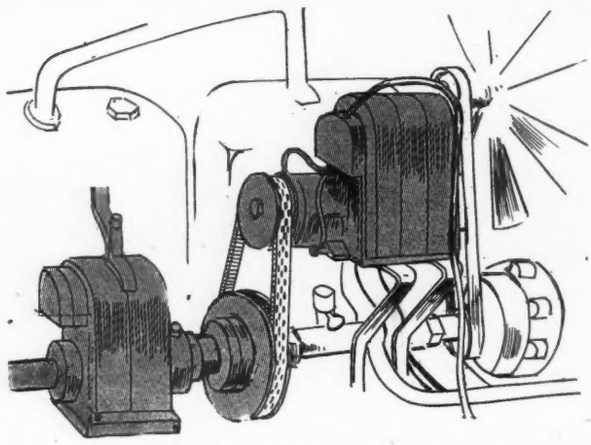
KNOX

IN addition to the continued chassis of last year, the Knox line for 1913 includes a new six, smaller than the former Knox six. The new motor, like previous Knox designs is composed of cylinders cast in pairs, with valves overhead. A feature on all four models is the inclosing of the rocker arms in metal inclosures, covered with aluminum cover-plates. Silent chain drive is used for the camshaft and magneto drive, and a new four-speed gearset is supplied on the new six, whose feature is spiral cutting of the gear-teeth.

The speedometer drive has been changed from the usual arrangement from the front wheel to the forward end of the main transmission shaft. This position permits a more direct drive, and eliminates the excessive vibration incident to unsprung axle mountings. The sixes are equipped with a dynamo electric lighting system, while the fours have the option of electric lights supplied by a storage battery. A novel feature in the new model is a V-shaped radiator.



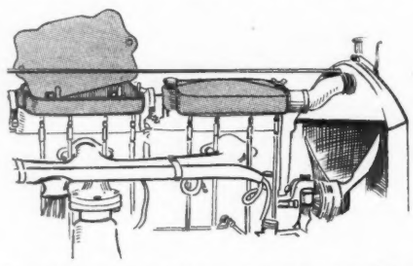
Wide-face silent chains used in timing drive of Kisselkar



Generator, fan, magneto and pump are driven from a single shaft on the Kisselkar

LENOX

FOR 1913 a six has been added to the line of the Lenox Motor Car Co. The four-cylinder model is retained. The motor is 4¼ by 5½, instead of 4⅛ by 5¼, as formerly and the car is heavier. The motor is cast in block instead of in pairs, and the rea raxle is of the three-quarters floating type, instead of semi-floating. Two inches have been added to the wheelbase, making it 118 inches, and 36 by 4-inch tires have taken the place of last year's 34 by 4. The Gray & Davis electric lighting and starting system is used on all models.



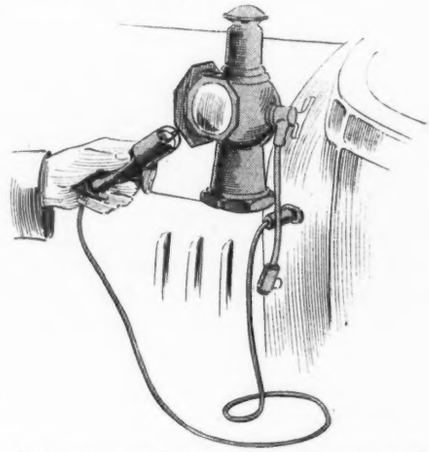
Overhead valve inclosures and V-type radiator, with propeller-type fan on Knox six

The six-cylinder motor is of the T-head type; therein differing from former L-head Lenox practice. The cylinders are cast in threes, 4 by 5. The chassis throughout is similar to the four, except that it is larger and heavier. The wheelbase is 130 inches, and the tires 35 by 4½. Body types include roadsters for two, three, and four passengers, and touring cars for four and five, on the four-cylinder chassis, and a five-passenger Benz type touring car and seven-passenger limousine, on the six.

LOZIER

ANNOUNCEMENT of a new light six is the principal feature of the 1913 Lozier propaganda, signifying an effort to get away from the exclusively high-priced field, and signalling the abandonment of the long-cherished single-chassis policy of the Lozier manufacturers. The former Lozier six has been replaced by type 72, the first change of model since 1908 that has been made by this company. It is of six cylinders, cast in pairs, with valves on opposite sides, shaft drive, with left-hand steer and center control. Lozier characteristics have not been changed, but hardly a feature of the car has escaped modification of design, tending towards refinement. Valves have been enlarged, their chambers machined to prevent carbon deposit, an air pump for the maintenance of fuel pressure has been fitted, the Bosch double-dual ignition system has been installed, the Rayfield carbureter is used, an entirely new throttle-controlled variable-level lubrication system is used, and many other changes of a minor nature have been made. New body types, known as the Meadowbrook, Riverside and Knickerbocker, have been added to the line, and the older Lakewood and Briarcliff models improved.

The new light six, known as model 77, has cylinders cast in threes, with an L-head valve arrangement instead of the T-head that has always been the Lozier standard. The wheelbase on this model will be 127½ inches, and the tires 36 by 4½. The bore and stroke is 3⅝ by 5½, and the valves are all on the right side. The number of bearings has been reduced to three, instead of four as in former Loziers. These bearings are not ball bearings as in the older production, but plain white bearing metal is used. The Gray & Davis electric lighting and starting system is installed in this model, and a torsion tube has taken the place of the usual Lozier radius-rods as a means of propulsion. The Gray & Davis installation is especially compact in the Lozier installation, the complete system being confined to a location before the dash, as illustrated herewith.

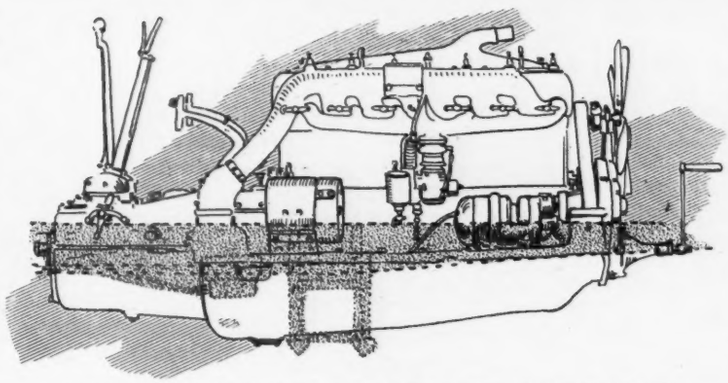


Distinctive side-light design with detachable plug-socket, showing trouble lamp

New body types applied to this model are the Touraine coupe, Fairmount runabout, and Mountclaire touring car.

LOCOMOBILE

THREE chassis of Locomobiles are offered, two of six-cylinder and one a four, and following the same general character of design. Model M, the large six, is the oldest of the line. Model R, the 38 six, is the newest addition to the line, introduced in 1912. Practically no changes have been made in the little six for 1913, the general characteristics being identical. The wheelbase is 128 inches, front and rear tires are 36 by 4½, the motor is of six cylinders, 4¼ by 5, and while rated at 38 horsepower, is said to develop 60 horsepower. It follows former Locomobile design, with new dimensions. Valves are situated on opposite sides, and the cylinders are cast in pairs. The same lubrication system, the same dual ignition and the same Locomobile carbuereter design are employed as in the big six. The principal changes in this model over 1912 are an increase of stroke from 4½ to 5½, the bore remaining 4½, increased valve diameter, changes in the inlet and exhaust passages to make the gas passage freer, and a new carbureter design. A new magneto has been installed in the ignition system, and the oil pump has been moved to the inlet side of the motor from its former position on the exhaust side. The cooling system has undergone an increase in capacity, and the pump moved to make room for the lighting generator. The Locomobile electric motor starter, something new, has just been announced.

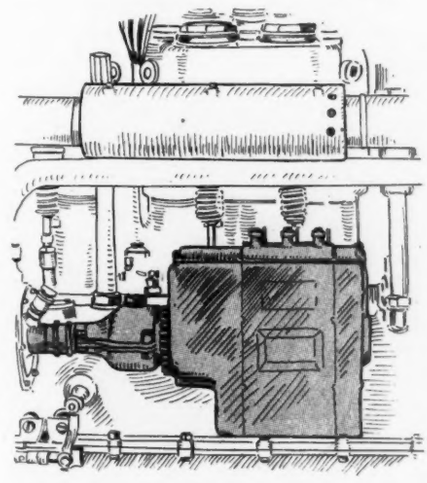


Compact starter installation in unit power plant of Lozier light six

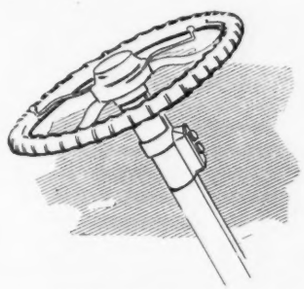
LITTLE

ONE of the latest to make its debut is the Little six, which with touring car body is placed on the market. Its wheelbase is 106 inches and its motor a six-cylinder, L-head type which is suspended at three points. The bore is 3¼ and the stroke 4¼ inches, and the cylinders are cast in blocks of three. Thermo-syphon cooling is employed as well as a vacuum system of lubrication. Bosch magneto furnishes the ignition current.

Other features include a cone clutch, three-speed, selective transmission, specially designed semi-floating rear axle, double internal-expanding hub brakes, platform rear spring suspension, left-hand drive. The car is fully equipped with top, windshield, speedometer, demountable rims, rear tire holder, complete electric lighting through generator, electric horn and tools.



Railway-type of lighting generator used on Locomobile six



Buttons on steering column of Lozier six, which control Klaxon horn and dash light

The Little Four roadster is continued from last season with practically no changes of importance. The power plant of this car is a four-cylinder motor, a unit with the clutch and gearset. The flywheel is located at the front and is cast with fan-vanes to aid in cooling the radiator. The cylinders are cast in pairs, valves on the left side, thermo-syphon cooling, a cone clutch and two-speed selective gearset. Shaft drive is used to the semi-floating rear axle. The wheelbase is of 90 inches, and 30 by 3-inch tires are used. The body is a two-passenger fore-door type, with a cowl, and an oval tank in the rear.

MAXWELL

FEWER models by one of Maxwell cars are to be produced this year. The two-cylinder Messenger has been discontinued, the Special has been continued as model 10, and the Mascotte and Mercury so altered as to practically constitute new models. They are known as models 4 and 8, respectively. The principal changes in the model 10 are the use of a cellular radiator instead of the former tubular type, the carbureter in this year of Maxwell manufacture, instead of the former Stromberg, and the gearset, formerly progressive, is this year selective. The wheelbase is 1 inch longer than last year, measuring at present 115 inches, and the tires have been increased in size from 34 by 4 to 36 by 4.

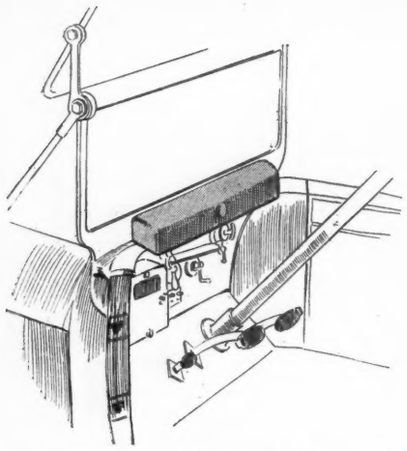
Electric lights and starter are to be included as standard equipment on all models. Model 8 is of four cylinders, 4 by 4⅝, with cylinders cast in pairs instead of singly, as has always been Maxwell practice heretofore. It otherwise follows the design of model 10 very closely, except that the progressive gearset is still adhered to. A semi-floating axle is used instead of the floating axle used on the large car, the wheelbase is 106 inches, tires 32 by 3½, and right-hand control is used instead of left-hand. Model 4, last year the Mascotte, has cylinders 3¾ by 4, instead of 4 by 4, in pairs as they were last year, following the de- for left-hand drive and center control.

The front axle is tubular instead of I-beam, and a piston pump is used for oil circulation instead of the gear pump used on the other two cars. Features are a concealed horn under the hood of model 4; the center control, with a single clutch and brake pedal, increased body room in all models, improved fender designs, a new single-pane windshield, built in as a part of the body; a roomy luggage space back of the rear cushion of the Maxwell 10 roadster, and a combination tire, lamp and license bracket.

MARATHON

ASIDE from a change in type names, little alteration has been made in the 1913 series of Marathon cars. The three models will be known as the Runner, Winner, and Champion. The runner, formerly the K-20, has had an enlargement of the

Lozier left-hand drive and center control, as embodied in light six design



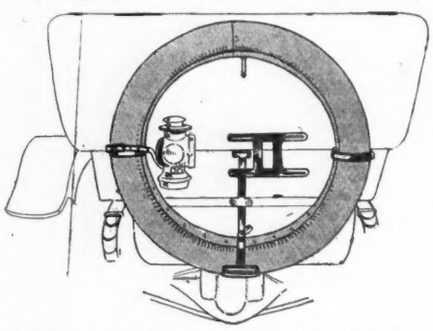
Cast aluminum ventilating dash and windshield, showing Adlake lighting and charging governor

motor from 3¼ by 3½ bore and stroke to 3½ by 4½, the wheelbase has been increased from 96 to 104 inches, and the tires from 32 by 3 to 32 by 3½ inches. This model is fitted with a two-speed gearset, and a semi-floating rear axle.

The Winner, the continued M-40, has a floating axle this year, instead of the semi-floating type used formerly, the wheelbase has been shortened from 118 to 116 inches, and has a motor 4¼ by 4½. The Champion has cylinders 4½ by 5⅛, and differs in no way from the previous N-50, except in the substitution of a floating axle for the former semi-floating type. All cars are fitted with Roadster and five-passenger touring bodies, while the Winner has a coupe in addition, and the Champion, a seven-passenger touring body.

MOON

REFINEMENT and development is noticeable in the Moon line for 1913, the feature of the new series being a medium-priced six-cylinder model. Model 65, the six, has cylinders 4 by 5¾, and is claimed to deliver 65 horsepower on the brake, with T-head cylinders cast in pairs. Valve mechanisms are inclosed in aluminum housings. The old valve-in-the-head motor has been abandoned, present engines being of the T-head type exclusively. The flywheel fan, however, is retained. Steer is on the left side of the new cars, with the levers in the center. The other two models consist of the 39, with cylinders 4 by 5¾, and a wheelbase of 116 inches,

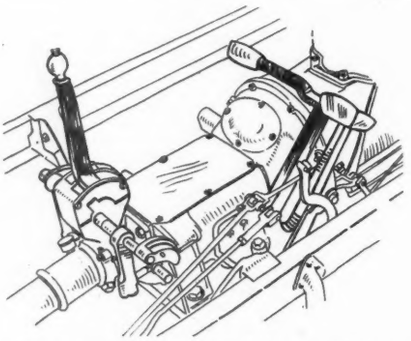


Tail lamp, tire irons, and license bracket combination on Maxwell

and model 48, with cylinders 4½ by 5, and a wheelbase of 121 inches. An electric starter and lighting system, manufactured by the Wagner Electric Co., of St. Louis, is fitted. This consists of a motor-generator, connected to the crankshaft by a chain and planetary gears, and provides current for lighting. Body types include touring cars, roadsters, colonial coupes, limousines and Berline limousines on all models.

McINTYRE

McINTYRE cars will appear in a single six-cylinder chassis for 1913. This model will be known as the 6-40 limited, and will sell at an unusually low price for a car of such design. The motor is of the T-head type, with the cylinders included in a single monoblock. Cooling is by the thermo-syphon system, while ignition is dual battery and magneto. A gravity-fed Stromberg carbureter is used. A multiple disk clutch and four-speed selective gearset together with the flywheel are inclosed in an extension of the crankcase



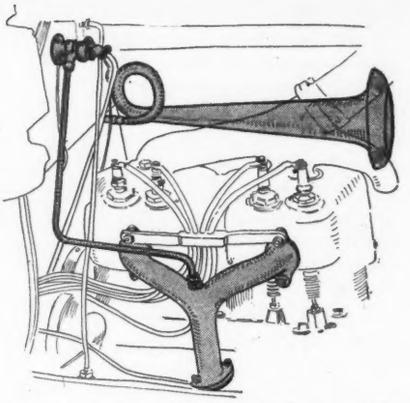
Center control, electric lighting generator and battery as installed in Mitchell cars. McIntyre right-hand drive, center control and unit power plant.

in one unit. The only visible moving part of the machine being the fan and road wheels. The rear axle is of the floating type. The wheelbase is 116 inches, and the tires 34 by 4. Right-hand drive, with center control by a single lever, is used. Starting is accomplished by an electric starting device. Equipment includes five demountable rims, mohair top and envelope, windshield, electric horn, speedometer, clock and a dust cover for the car.

MICHIGAN

LARGER and more powerful, the Michigan appears in a new model for 1913. This chassis is cataloged as two models, R and S, whose only difference, however, is in the body, location of the gasoline tank, and rake of the steering column. In brief, the car is of four cylinders, 4¼ by 5¼, cast in block, with all valves on the right side. A special feature is bevelled and drilled ring grooves, to drain off superfluous oil from the piston. Lubrication is by the constant-level splash system.

A leather-faced aluminum cone clutch and four-speed gearset are used, and a three-quarters floating rear axle. Left-



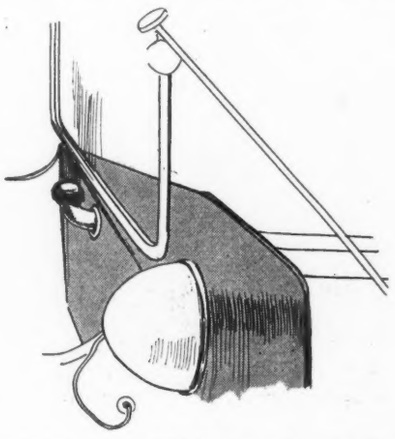
Manifold starter and concealed horn on Maxwell 22

hand steering and center control are embodied in this car, and the following regular equipment: Top, envelope, windshield, electric lights, electric horn, speedometer, 35 by 4½-inch tires, demountable rims, one spare, and running-board tool boxes. Electric or gas starters will be installed at extra cost. Last year's model is continued in a 1913 series, in both roadster and touring bodies.

MITCHELL

THE Mitchell 1913 announcement conveys the information that the new models of this make are five in number, built on three chassis—a 40 horsepower, four-cylinder, and a 60 horsepower, six-cylinder, on either of which two and five-passenger bodies are fitted, and a 60 horsepower, six-cylinder, with a seven-passenger body. The former Mitchell line of five chassis types has been discontinued.

The motors are entirely new, being of the T-head, long stroke type with cylinders cast in pairs. Formerly L-head motors were used. The same general type of design runs through all of the new power plants, the only difference being in the dimensions, which are 4¼ by 7 inches on the larger six and the four, and 3¾ by 6 inches on the little six. The gearsets are in unit with the motors, the entire power plants being carried at three-points. Camshafts and magneto shafts are driven by specially-cut gears, the magnetos and

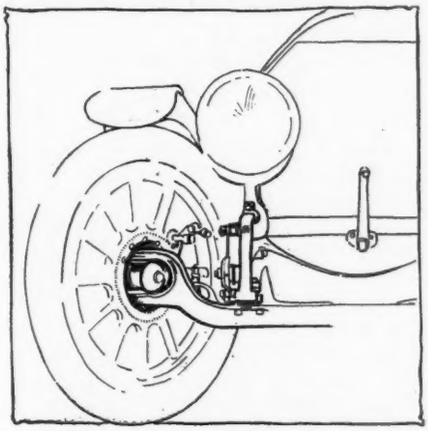


Fuel dash tank of Moline cars has its filler-cap on dash

water pumps being located at the ends of transverse shafts at the forward ends of the motors. This is another feature new to Mitchell construction.

Features of the chassis construction of the new Mitchell designs involve a cone clutch, drive shaft inclosed in torque tube and braced by radius rods, three-quarter elliptic rear and half-elliptic front springs, floating rear axle of new type in which the live axle members are bolted rigidly into the wheel hubs by square tapers drawn up solidly by castellated nuts, left hand drive and center control, gasoline tank slung at rear of frame.

The new Mitchell cars are all equipped with a specially-designed Esterline electric self-starter, involving a generator inbuilt to drive from the gearbox and a motor which gears to teeth cut in the flywheel face. The entire starting mechanism weighs 35 pounds. Motors are fitted with compression release and hand priming devices to facilitate starting. Bodies have all been redesigned and have

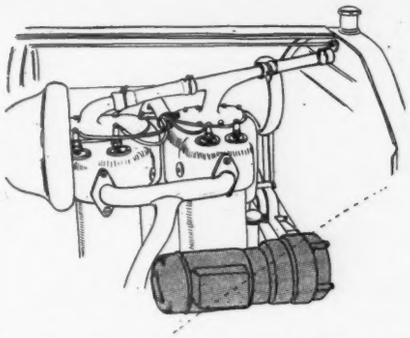


Steering knuckle is in the center of wheel-plane on Marmon six

all the characteristics dictated by present day motor car fashions. The low angle cowl dash, flush-sided body lines, clean running boards and rangy appearance are all notable. The aim has been to completely equip these cars. The platform type rear spring has been abandoned for the three-quarters elliptic type on all models of the Mitchell car.

MARMON

THE MARMON 32 is continued for the fifth season with minor improvements. The Marmon six, while announced in 1912, was not ready for active entry into the market until the beginning of the 1913 season, in the early fall of 1912. Model 32 continues practically without change for 1913. Additional equipment, however, is offered at the purchase price, and the body types have been greatly improved. The car seems to set lower than formerly, and the graceful double curve has been embodied in the front fenders,



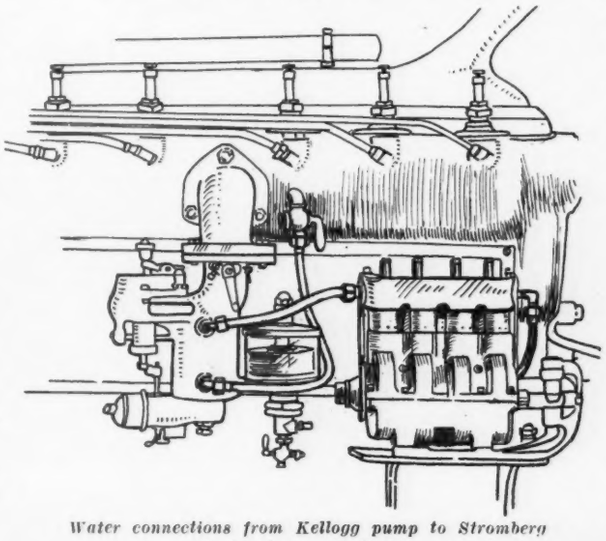
Location of motor-generator of Moon lighting and starting system

which greatly enhance the beauty of appearance and facilitate access to the motor.

Left-hand drive and center control have been adopted on this car, and a special carbureter, designed by Ray Harroun, the racing driver of Marmon cars. The two-spark dual Bosch ignition system has been substituted for the simple dual system formerly used, and a Northeast electric lighting and starting system has been installed.

The Marmon six has its cylinders cast in pairs, with valves opposite. The bore and stroke are 4½ and 6 respectively, the gasoline tank is located in the rear and feeds by pressure to the Harroun carbureter. The multiple-disk type of clutch is used, and the gearset is incorporated with the rear axle as in usual Marmon practice.

A wheelbase of exceptional length, 145 inches, is made possible without sacrificing turning ability, by a special front steering-knuckle arrangement, wherein the king-bolt is situated in the center of the wheel plane, thus allowing the wheels greater cramp than with the usual construction. The tires are 36 by 4½ in front and 37 by 5 in the rear. Three-quarters elliptic springs are used in the rear instead of the elliptic type that have always characterized Marmon construction. Both types are fitted with a large variety of standard body types, with complete

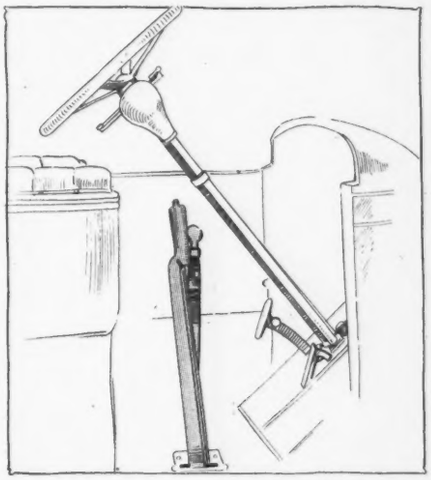


Water connections from Kellogg pump to Stromberg carbureter on McFarlan

equipment. In lieu of the demand for carrying space a large trunk is placed on the left running-board, in front of the door. This position does not induce skidding, as a rear position might.

McFARLAN

BASIC principles of construction have been little altered in the new series of McFarlan cars, this car being added to the growing number of those whose makers have forsworn the yearly change of models. The two 1912 sixes are continued as series S and M respectively. A noticeable feature of the new line is that all models will carry the three-quarters floating type of rear axle formerly used only on the larger model. This includes a new model which has been added, known as series T. Other changes to be noticed are the placing of the steering tie-rod above and behind the axle instead of in front, as formerly. Tires are carried at the rear of all models, on a special



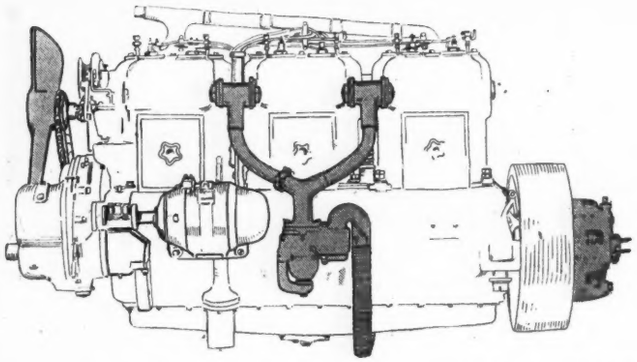
Center control on Maxwell 40, showing single pedal for clutch and service brake

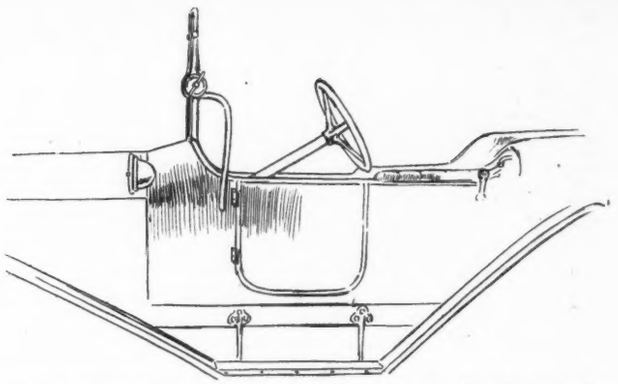
tire-holder included as regular equipment on all models.

The model S motor is now hung on three points instead of four, the valves are inclosed, the water pump moved forward and an air pump for starting placed behind it, while a lighting dynamo takes the place vavated by the air pump.

An interesting feature of the grouping of the various accessories of this motor in the facilities for water cooling the air-pump and warming the carbureter. Water is taken from the lower parts of the system, when cool, and lead through the pump. Another pipe leads from here to the carbureter, and from thence to the upper part of the cylinder jackets.

Series M, formerly the large six, remains unchanged with the exception of the generator lighting system. The feature of the line is the new model T. This chassis is fitted with a motor that shows the





Marmon six with aeroplane fan, showing generator drive, special carbureter, novel intake piping, and new multiple-disk clutch. New lines of Mercer roadster, with compact windshield

effect of the most advanced European ideas. It is of six cylinders, 4 by 6, cast in a single block. Four bearings are used, and the valves are situated on opposite sides, their mechanisms being inclosed in the cylinder block and covered over by removable aluminum plates. The inlet passages are all internal of the engine castings. A Stromberg water-jacketed double-jet carbureter is used, and a starting system consisting of a Kellogg four-cylinder air pump, tank, distributor and individual leads to the cylinders.

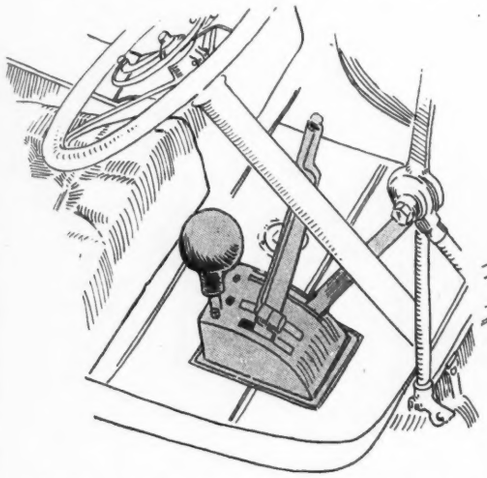
The chassis details of this model are very similar to those of model S, except that the clutch is heavier, and various modifications in dimensions. As in all McFarlan models, the gearset is a unit with the rear axle. The Vesta electric lighting system is used on all models, with adjustable-focus headlights.

MATHESON

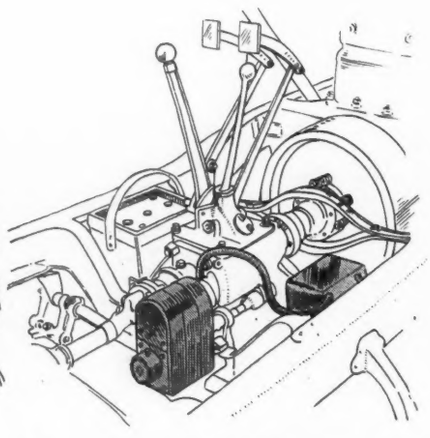
THE single-chassis creed has been adopted by the builders of the Matheson. The four-cylinder chassis of last year has been abandoned, and the Silent Six continued in a series with past productions, without radical modifications in design. This model is known as series C, being the third series of the original design of this car. No change has been made in the overhead valve arrangement, the multiple disk clutch, nor the rear-axle gearset that are Matheson essentials. The center control and two-spark high-tension dual ignition were last year's features, to which have been added an electric starting and lighting system, of Westinghouse manufacture, and a full set of shock absorbers, as regular equipment. The chassis is the continuation of the larger of the two sizes, having the same wheelbase of 135 inches. Features in the body details are two sole-leather suitcases under the seat, side lockers inside the running board webs, a new tire carrier, and refinements in the center control quadrant, including a horn bulb in the assembly.

MIDLAND

COMPLYING with the popular clamor for medium-priced sixes, the Midland Motor Co. has produced a six in addition to the four which it is continuing from last season. The new six has a T-head motor 4 by 5, with a 135½-inch wheelbase, 36 by 4½-inch tires on demountable rims, left-hand drive with control levers in the center, a floating rear axle, and the Gray & Davis electric lighting and starting system. The four-cylinder model has cylinders 4½ by 5¼ instead of 4½ by 5, as last year's motors measured, and with a 122-inch wheelbase instead of wheelbases of 115 and 118, as on the former three models. Left-hand drive and center control are also new features.



Center control quadrant of Matheson six, with horn bulb attached



Center control, electric lighting generator and battery as installed in Mitchell cars

The rear axle is floating, and the tires are 35 by 4½, fitted on demountable rims, as in the former models. The Gray & Davis electric system is fitted on this model also, and both models are sold with full equipment. The bodies have been altered to fit the new chassis dimensions, and in such redesigning have been brought up to date.

MERCER

UNDER a new series, the Mercer Automobile Co. builds four models on two chassis. These are called G, H, J and K and are, respectively: four-passenger touring, five-passenger touring, raceabout and roadster. The changes which have been made over the preceding series are as follows: The Rushmore electric starting and lighting system has been added to all the models except the raceabout; the Bosch ZR4 has been substituted for the Bosch DR4; and both models J and K have four-speed gearset with direct drive on fourth, instead of the three-speed type employed in the preceding series. The other two models continue the four-speed gearset, but direct drive has been changed from third to fourth speed. Control levers have been brought inside the body on the model H and the body has been widened somewhat; the pressure system of fuel feed in models is now controlled by a mechanical pump instead of by the exhaust pressure, and the motors of models G and H are 32.4 horsepower, S. A. E. rating, while those of the raceabout and roadster, models J and K, respectively, are 30.6. The wheelbase of G and H is 118 inches and that of J and K is 108 inches.

MARION

NO radical changes marke the advent of the new season in the Marion line. Three models on two chassis are continued from 1912, one chassis having been dropped. Model 35 of last year with the 4 by 4½-inch motor is abandoned, while models 36 and 37 are retained. Models 46 and 47, which were built on the same chassis as model 48, have been dropped, but model 48 is continued. The new series is designated series A, with the same model numbers.

Model 36A is a light touring car, dif-

fering from model 36 in that the wheelbase is 1 inch longer, 112 inches, refined body lines, and the use of a Disco starter. Model 37A, known as the Bobcat roadster, is a new body design on semi-racing lines. Model 48A differs from model 48 in refined body lines and the use of an electric starting and lighting system. Both models have been brought 1¾ inches closer to the ground, the springs are this year made of a special English steel, the brake cams have been enlarged, the wood trimmings are mahogany, and the steering wheel is provided with corrugations to afford a grip for the driver, with friction-retained control levers.

The body lines have undergone refinement and concealed tool boxes between the frame and running boards, a deep cowl dash being included in the new designs. The Marion features of rear-axle gearsets wide internal brakes side-by-side, and three-point motor support are retained for this year.

MOLINE

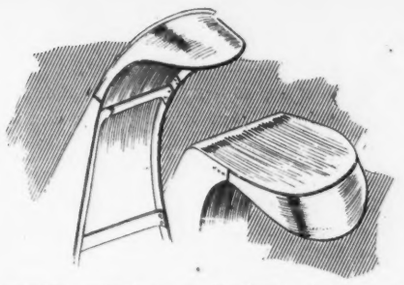
ADHERING strictly to the Moline one-model no-yearly-announcement policy for 1913 only such improvements as development has indicated as expedient have been made in the continued model M-40, known as the Dreadnaught. Notable in the changes that have been made is the new location of the main gasoline tank, under the cowl of the dash. Eight gallons are carried in this tank and twelve more in the auxiliary tank under the seat. The tanks are filled through a filler plug on the dash, while the extra fuel is elevated to the dash tank by means of a force pump.

This position of the tank permits raising the carbureter 6 inches, thereby reducing the likelihood of manifold condensation and making the carbureter more readily accessible. Another modification is the application of the Ward-Leonard electric lighting and starting system. This system consists of a chain-driven generator, a 6-volt battery and a motor geared to the flywheel. The new bodies are fitted with Turkish rocker-spring upholstery, and a new style of rain-vision windshield. Other characteristic features, such as the long stroke 4 by 6 motor, cork-inserted clutch, and vertical gearset, with the large wheels and elliptic rear springs that distinguish this model, are all retained for the season just opening.

METZ

GENERAL specifications of the Metz 22 remain unchanged for 1913 over those of either 1912 or 1911, when water-cooling was first given the preference over air. This is in accord with the Metz policy of standardization, which makes the low price asked for this car possible. The only new feature of the 1913 product is a touring car body, to carry four persons that will be installed on the regular chassis.

Briefly, the engine of the Metz is of four cylinders, cast in block, with a detachable waterjacketed head. The crankshaft is carried on three bearings and the crankcase is divided on a horizontal plane. The valves are side by side on the left side, their mechanisms inclosed under cover plates.



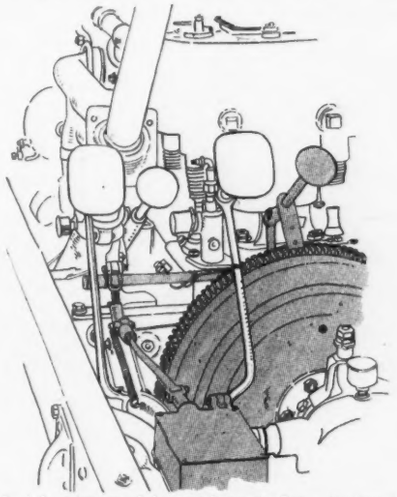
Invisible fastenings on National fenders, and how they are made

Fixed single magneto ignition and thermo-syphon cooling are used, the carbureter being supplied by gravity from the tank carried on the back of the seat. Friction drive to a countershaft and chains from thence to the rear wheels, constitutes the transmission, while the body is supported on four elliptic springs. Propulsion being through radius rods, the rear springs are relieved of driving stress. Left-hand steer and center control, a tubular front axle and internal expanding brakes are features.

MOTORETTE

ALTERATIONS of a radical nature have been made in the Kelsey three-wheeled Motorette for 1913. The most noticeable of these is the adoption of a four-cycle double-opposed motor, in place of the two-cycle type used previously. The front tires are this year 28 by 3-inch motor car tires, instead of the motor cycle tires on the last-announced production.

The new motor is double-opposed, with offset cylinders and mechanically-operated valves, their mechanisms inclosed. The motor is 3¾ inches square, and is lubricated on the circulating-splash system. A new radiator is used, of the vertical flat-tube type, located at the rear of the seat. The finish has been improved, and the Kelsey stabilizer added to the front suspension. This device consists of two arms on a common shaft, attached to the front axle at their ends, the shaft being mounted on bearings carried by the body. The action of this device is to prevent the rocking of the body, which would cause the rear wheel to sway and wear the tire unduly. It is produced in but one chassis model, with various equipment, as formerly.

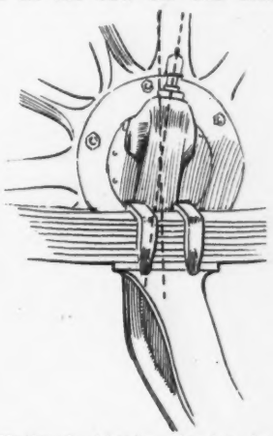


Electric starter drive and control on improved Series V National.

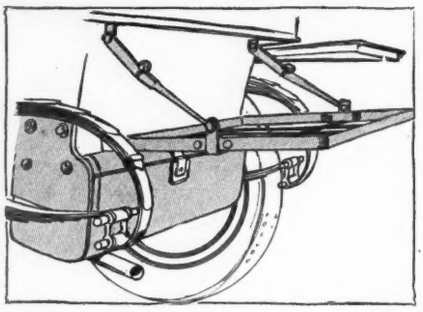
NATIONAL

NO seasonal announcements are made by the National company. Series V, the last announcement of this concern, was inaugurated in May. Consistent with the series policy, this car embodies few radical departures from National cars of former years, and is substantially only an evolution of the original National 40. The former nearly square motor was thrown over in favor of the long-stroke type last year. However, considerable difference is to be noticed in the new car and its predecessors. The control is on the left side, so the whole motor has been turned around, the carburetor and inlet valves being moved to the left side, and the exhaust manifold and valves, to the right. Other important changes are in bore and stroke. The new motor is 4⅞ by 6 instead of 5 by 5⅞, as in the last series. The valve springs and rods are inclosed in telescopic tubes to eliminate dirt and noise. The propeller shaft is no longer inclosed in a torque tube, but is provided with two universal joints, and a tapering pressed steel torque member is provided.

The floating axle has been redesigned, and the gasoline tank has been moved to a low position at the rear of the car, under pressure feed. A small tire pump is fitted to the engine, and the gearset has been turned end for end, so all reductions are ahead of instead of behind the master gear, thus permitting this member to revolve at slower speed than in the other arrangement. The new gearset is mounted on ball-bearings. The fenders are wider and deeper than formerly, and have no panel work stamped on them, but are left plain. A specially designed tire-carrier is installed on the new car and tool boxes



Caster steering knuckle on improved National



Tool box and trunk-rack on Pope-Hartfords.

have been placed behind the running boards.

The wheelbases of the roadster and touring models are 120 and 128 inches, respectively, instead of the former 124 on both models. The body lines have been greatly improved, and they all set closer to the ground. The Gray & Davis electric starting and lighting system is included as regular equipment. A special speed model is supplied on special order, with a bore and stroke of 5 by 7½.

NYBERG

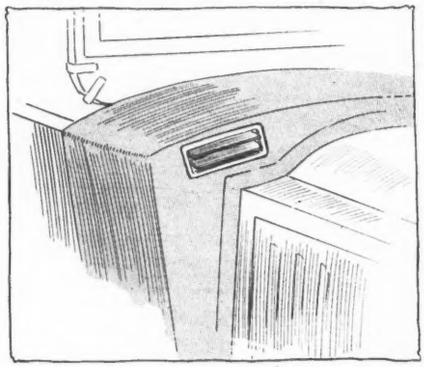
A FOURTH model has been added to the Nyberg line. Last year two sixes and a four were offered by the Anderson firm, but this year another four has been added. The latter is the smallest of the number, and is known as the 4-37. It has cylinders 3¾ by 5¼, and the wheelbase is 118 inches. The other models are the 4-40, with cylinders 4¼ by 5¼, and a wheelbase of 118 for the roadster, and 126 for the touring car. Model 6-45 has a wheelbase of 126 for the roadster, and 134 for the touring model, with a bore and stroke of 3¾ by 5. The 6-60 has cylinders 4¼ by 5¼, and the same wheelbase as the smaller six.

All models are similar, except that whereas the new four has its cylinders cast in block, the older types use individual cylinders. Unit power plants are installed in all models, with inclosed flywheels, multiple-disk clutches, and 3-speed selective gearsets. Shaft drive with separate torsion tubes in connection with floating rear axles are used. Model 6-45 has its cylinders cast in pairs, being otherwise of the same specifications as the other two of the continued chassis. Body types comprise roadsters, touring cars, of five and seven-passenger capacities, and four passenger tourabouts of a distinctive design.

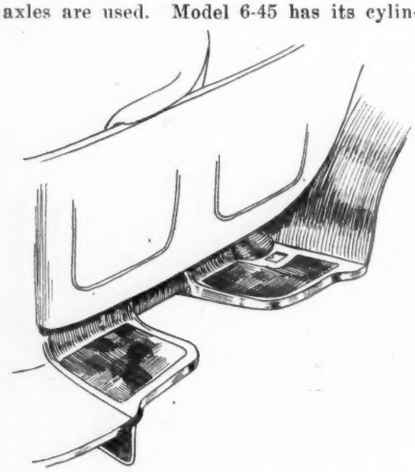
NORWALK

OFFERING a new model, the Norwalk Motor Car Co. introduces the second series of Norwalk underslung six-cylinder motor cars. Model B, the pioneer six among underslungs, shows a few radical changes from former structural features. An option of left-hand drive is offered, the T-head motor has been adopted in preference to the former valve-in-the-head type, the new motor having its cylinders cast in blocks of three instead of in the pristine practice of twin blocks. Valve-mechanisms are inclosed instead of exposed, as formerly. An electric starting and lighting system has been installed, and the Atwater-Kent ignition system employed instead of the formerly favored magneto. The cast-steel rear axle has succumbed to the preference for the lighter pressed steel type.

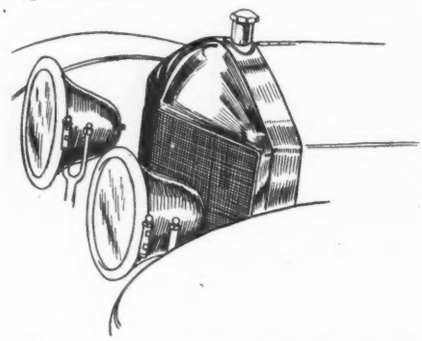
In brief, this car has six cylinders, 4½ by 5½, a Carter carbureter, Atwater-Kent ignition, Gray & Davis electric lighting and starting, a multiple-disk clutch and four-speed gearset integral with the motor unit, a 144-inch wheelbase, and 41 by 5-inch tires. Model A and A-Special differ in that whereas model A has gravity fuel feed, the other model has a pressure system. The former has a wheelbase of 127 inches and tires 38 by 4½, while the latter has a 136-inch wheelbase and 40 by 4½-inch tires.



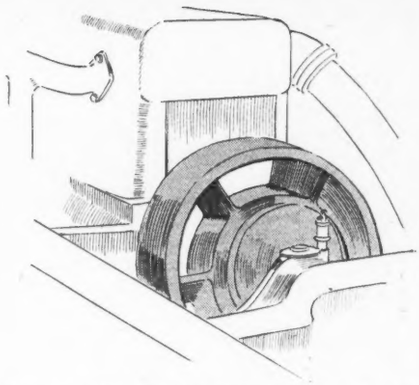
Packard dash ventilators, which resemble old-time casement blinds



No running boards are used on Oakland cars, aluminum steps secured direct to the low drop frame taking their place



Oakland V-shaped radiator, finished in german silver

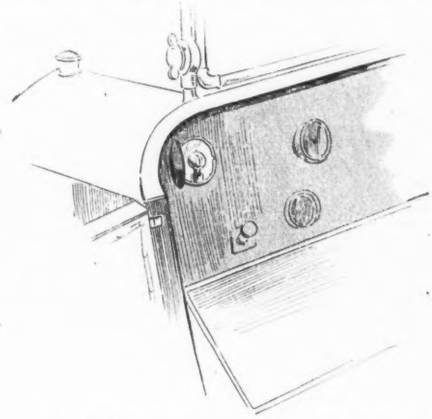


New Premier has fan-vanes cast in the flywheel to assist in cooling

The motors are of six cylinders, 4 by 5, similar to the large six motor, except in size, with the transmission system the same, and carrying respectively a four-passenger tourer and a two-passenger roadster, and a six-passenger tourer and two-passenger roadster. Model B carries a six-passenger tourer only. Equipment on all models is complete, including demountable rims, with a spare included, shock absorbers, top, windshield, etc.

OAKLAND

RADICAL changes have been made in the continued four-cylinder Oakland models, and a new six-cylinder chassis added. Three four-cylinder models are included in this offering, known as models 35, 40, and 42. Model 35 has a 3½ by 5-inch motor, while the other two have 4⅛ by 4¾-inch motors. The new 6-60 has cylinders of the same dimensions. This is in accord with the Oakland conception of standardization. The models of last year consisted of three four-cylinder models, a 30, a 40, and a 45. The 30 has been abandoned in favor of the new 35, which is of four cylinders 3½ by 5, with a 112-inch wheelbase, 32 by 3½-inch tires, and the only semi-floating axle used in the line. The 40 has been continued, with the same 4⅛ by 4¾-inch motor, but with a wheelbase of 114 instead of 112 inches, and a floating rear axle instead of last year's semi-floating type. The 45 has gone the way of the 30, being superseded by the six.



Side lights are set into the dashes of the Oakland, and may be used as dash lights, by opening the rear doors

Model 42 is very similar to the continued model 40, but has a wheelbase of 116 inches, and the new features that are included in the design of the six-cylinder model, except that silent chains are used in the camshaft drive of the six, instead of the gears as in the 42. New V-shaped radiators are used on the two larger models, and no running boards are used. Instead of the latter, wide cast aluminum steps are placed under each door. The Deaco lighting and ignition system is used, and full equipment is offered with all models.

OVERLAND

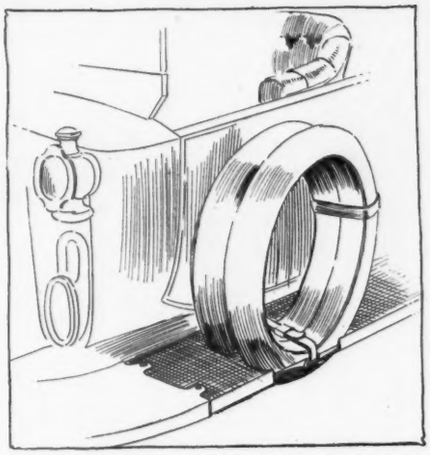
IN accordance with the Overland standardized production scheme, two chassis, little differing from last year's models will be produced for 1913. These, models 69 and 71, replacing models 59 and 61, respectively, show differences from their predecessors only in minor details, bodies, and equipment. Bodies are deeper and longer, with lower and deeper seats. The roadsters are provided with sloping tool and supply boxes at the rear of their oval gasoline tanks, and on model 71, running-board tool boxes have been placed. Model 69 has undergone an amplification of wheelbase, being 110 inches, instead of 106, as previously. Model 71 continues the same 114-inch wheelbase as the 61. Model 71 has a dynamo electric lighting system, and both models are provided with a liberal equipment. A new cowl dash and a ventilating windshield have been adopted.

ONLY CAR

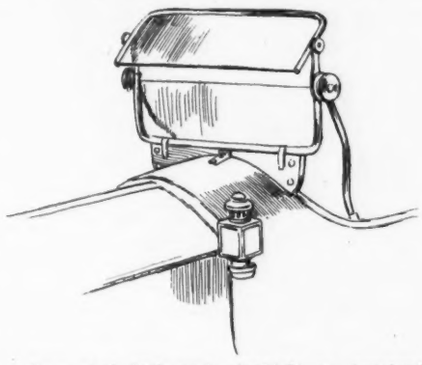
NO changes whatever will be made in the Only Car for 1913. As in the 1912 production, the 1913 cars will embody the features of a four-cylinder T-head block motor with an exceptionally long stroke, the bore being 4¼ inches and the stroke 7⅞. Ninety pounds compression is carried. The valves are uninclosed, the intake valves on the right, the exhaust on the left. A two-passenger raceabout and four-passenger touring car are supplied to this chassis.

OLDSMOBILE

OLDSMOBILES, which have for so long appeared in a number of models, have been placed on the present market in the single-chassis series system of manufacturing. Sixes only will hereafter be manufactured by the Lansing makers, the type offered for 1913 differing from past six-cylinder productions in that it is more highly refined and of smaller size. Cylinder sizes have dropped from 5 by 6 to 4⅛ by 4¾. Weight to the extent of about 1,000 pounds has been pared from the car. The valves are all on the left side, instead of opposite, as previously. A Stromberg carbureter has taken the place of the carbureter of Olds manufacture used last year.



Tire brackets on left-hand-drive Packard 38



New cowl dash and winshield on Overland

The unit motor, clutch, and gearset has been adopted for the first time by this company. The wheelbase has been condensed from 140 inches to 135 inches. The tires have shrunken from the extreme diameter of 42 by 4½ and 43 by 5, to 36 by 4½. Three speeds have been judged sufficient range for this model, instead of 4 as on its larger forebear. In addition to these chassis differences, the bodies have been hung lower and the springs have been lengthened. A new design has been introduced in these bodies, having the greater portion of the side consumed by doors of great width. The Delco system of lighting, starting, and ignition is used on these cars, dispensing with the magneto and gas lighting accessories. A power tire pump, attached as a unit with the starting gears of the dynamo, is included in the equipment, as are a Warner speedometer and clock combination, an electric horn, an extra demountable rim, a new single-pane rain-vision windshield, a new gasoline pressure regulator, and bullet lamp equipment.

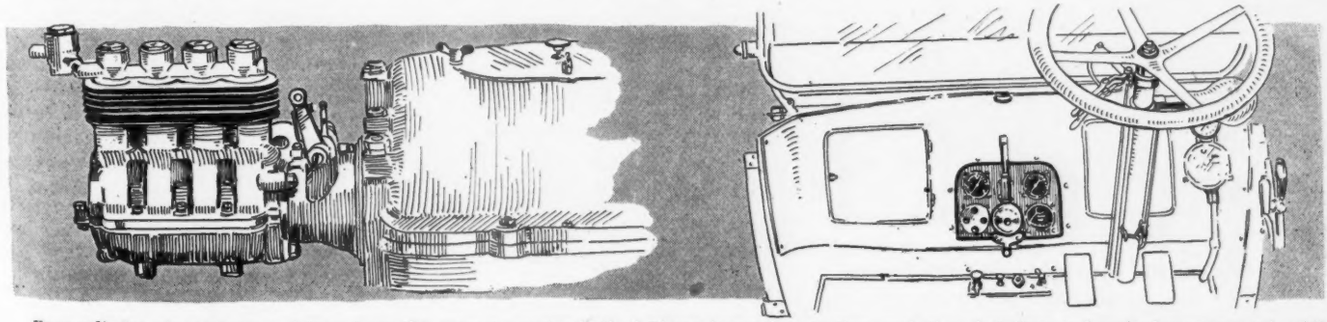
PALMER & SINGER

INCREASED production of Palmer & Singer cars is planned for 1913. The two sixes carried last year are continued practically without change, for the season just started. The four has been dropped from the regular line, but will be built on special order. The series plan of production has been adopted by this concern, and plans are laid to more than double the production of small sixes. A pneumatic starter, deriving the compressed air from a Kellogg water-cooled four-cylinder pump, driven from the pump shaft, a Dyneto dynamo-electric lighting system, slightly refined bodies, and the change from 34 by 4 to 36 by 4-inch tires on the small six, mark the only alterations in the 1913 line over that of 1912.

PACKARD

SIXES exclusively, in two chassis models, are to be manufactured by the Packard Motor Car Co. Changes in general design have been made in the new sixes, which are the result of logical evolution. The first of the sixes, model 48, announced early in the summer were soon exhausted, and the energies of the factory concentrated on the new light six, which will be manufactured until late this winter, when the construction of the large sixes will be resumed.

The extra length of the six-cylinder motors necessitated the abandonment of the four-point support used on the fours, all Packard motors for 1913 being suspended on three points from the chassis frame. The lubricating system is interconnected with the throttle, and the details have been worked out so that while the oil is circulated and recirculated through the



Four-cylinder air-compressor driven from the gearset countershaft of Pierce-Arrow for starting and tire inflating, and revised arrangement, with air control plate

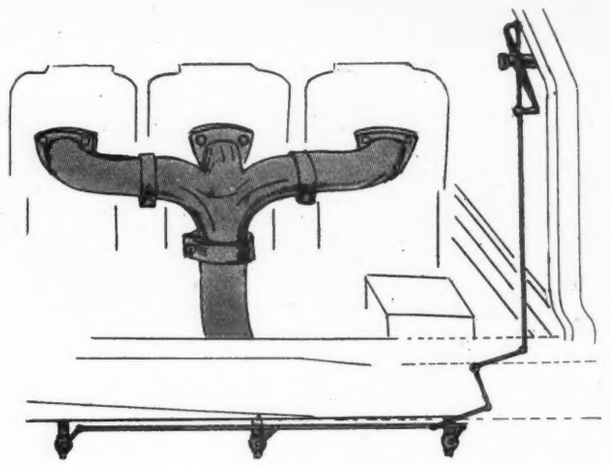
motor; no splash is used. The clutch and flywheel are separate, and are both inclosed by the flywheel housing. Another improvement in the crankcase consists of webbing it across to the frame, providing a substantial support for the magneto, lighting generator, etc., and eliminating the mud-pan.

The fuel tank has been located beneath the chassis frame at the rear, with pressure feed, and three-quarters elliptic springs are used in the rear. The little six differs from the larger model in that its cylinders are 4 by 5½, instead of 4½ by 5½. It is built in wheelbases of 115½, 134, and 138 inches. The T-head motor has been forsaken in this model, all valves being placed on the right side, inclosed by cover plates. The steering and control is on the left side, while in connection with the latter, an original feature has been introduced in the form of a control board, which takes the switches, starting control, electric horn button, starting shutter, and carbureter adjustment. On both models the Delco system of lighting and starting is installed, the ignition feature being cut out. Body types embrace all styles formerly offered, with minor improvements in style.

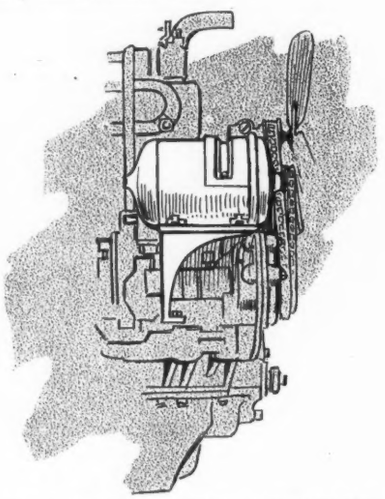
PIERCE-ARROW

WHILE the Pierce-Arrow line is continued with three six-cylinder models as has been the policy of the company for years since it dropped four-cylinder constructions, all three models have undergone a thorough house-cleaning, which places them much in advance of other makes in not a few engineering details. While generally classed as conservative this company has also been a pioneer, and when changes were deemed improvements there never was any hesitation in making them, irrespective of other makers. This year shows much improvement and some pioneering. Only one model has a larger motor, namely, the 36, which has been changed to 38, its stroke now being 5.5 inches instead of 5⅛. It has larger valves and more power, hence the increased rating.

Now for the general improvements that agree in all models: Gravity motor oiling is superseded by direct pressure feed at 20 pounds pressure to the seven crankshaft bearings and thence to crankpins and wrist pins. The old gravity oil tank above the cylinder is gone and the motor looks much cleaner. It is still a non-splash system. A compressed-air starter is fitted. The 200 pounds air pressure is created by a four-cylinder pump mounted on the front end of the gearbox and driven from the greatest counter shaft. It delivers to a reservoir on the chassis from which the motor draws. In addition to this there is the usual air piping and air distributer with dash control. The gasoline primer on the dash, connected with a nozzle in the manifold to facilitate starting, is continued and now all models carry compression releases.



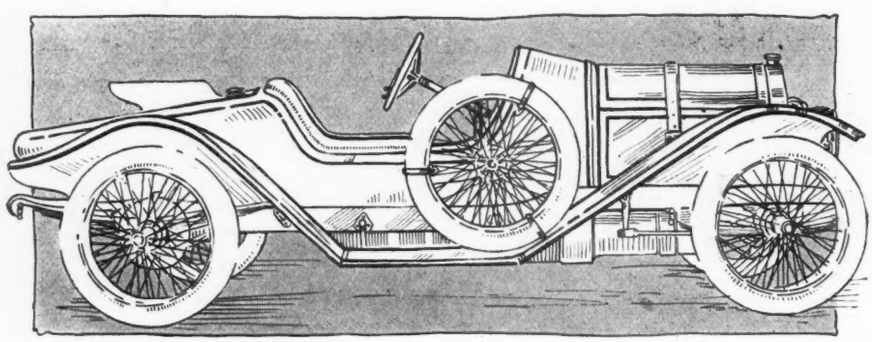
To prevent the heating up of the fore-compartment, the Peerless exhaust manifold has been redesigned. Hood can not be replaced until oil drain-cocks are closed



Fan and generator drive of Pope-Hartfords

The carbureter has been overhauled. It is a two-jet design, the auxiliary nozzle, located in the juncture of the auxiliary air passage with the mixing chamber, does not come into operation until speeds of 800 or over and the auxiliary air valve has opened. The two nozzles give better motor performances on low and high speeds. The needle valve in the main nozzle is improved by a protection which prevents its tapered end being injured when screwed up to finer adjustments. Leather disk couplings are used in the magneto and water pump shafts. These are quiet. Leaving the motor there are several other improvements: The German bronze facing on the clutch cone has been dropped and leather substituted, it being lighter and thereby facilitating gear-shifting.

Another clutch improvement is that the clutch rocker shaft is shorter and carried on two brackets from a frame cross piece instead of from the frame side members, thus freeing clutch engagement from the troubles of frame twists. There are two universals between the clutch and gearbox. Tubular propeller shafts are used, these making a weight reduction of 15 per cent and giving added strength. The drive shafts are removable in the rear axle. A Pierce-design of demountable rim is used. All open bodies are sheet aluminum instead of cast aluminum as formerly. Cast aluminum is used in the closed ones. Electric lights are standard, the motor carrying a Westinghouse generator. The usual Pierce coachwork is unchanged.



Pathfinder Cruiser, a stream-line creation, using McCue wire wheels

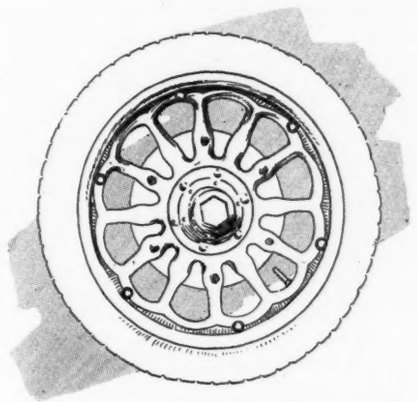
PILOT

LARGER and more powerful, and enlarged by the addition of a six, the line produced by the Pilot Car Sales Co. shows considerable improvement over the single model of the year just passed. The 1912 40 is a thing of the past, its successor, model 50, being larger throughout. The features that characterized it, though, are in the main retained. Those familiar with this car will observe that while the motor is still of the T-head block type, a three-bearing crankshaft and a 4½-inch bore, the stroke has been increased 1 full inch, being now 6 inches. It has a three-bearing crankshaft, and the timing gears, helically cut, are inclosed in the crankcase, insuring ample lubrication.

Valve mechanisms on the 1913 motors are inclosed by aluminum inclosures, and the inlet manifold is integral. The Pilot six motor also is cast in block, with valves opposite, but differs from the four in that

the timing gears are separate from the crankcase, and the crankcase is webbed to the four integral support-arms, leaving a convenient pocket for tools, bolts, nuts and small parts when making repairs or adjustments. Eisemann dual ignition is used on both motors, instead of the single ignition used last year.

The motors are hung on subframes and drive through cone clutches to three-speed gearsets, located amidships. Axles are of the floating type, while front axles are of the straight dropped I-beam type. Steering is from the left side and control is in the center, instead of on the right, as last year's cars were. In spite of the fact that the six is larger and more powerful than the four, it is said to weigh but 500 pounds more. Features that will appeal

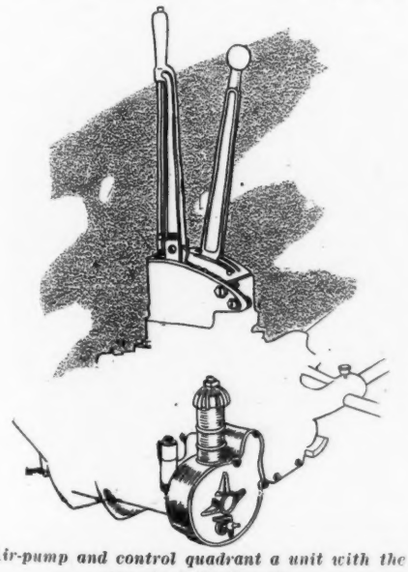


Chariot wood wheels offered as option to wire type on Pathfinder

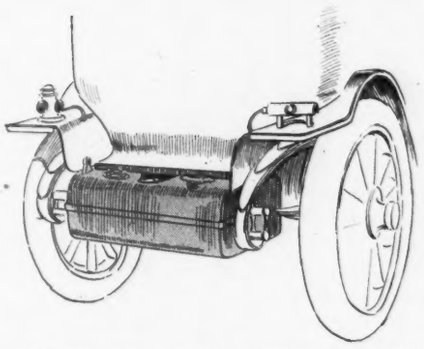
to the owner-driver are a power tire pump and the Gray & Davis electric lighting and starting system, with which these cars are equipped.

PREMIER

ANOTHER manufacturer to join the ranks of makers of sixes exclusively is the Premier Motor Car Co. Continuing the large six of last year, announcement was made in September of a new light six,



Air-pump and control quadrant a unit with the gearset of the Premier



Packard rear system, showing new three-quarters elliptic springs, position of fuel tank, electrically lighted license bracket, tail lamp, and fuel gauge

at a moderate price for the 1913 market. This model has been laid out with a view to making it convenient for the owner-driver. The big six is the same car as was marketed in 1912 as model M-6, with a motor 4½ by 5¼, and cylinders cast in pairs. The only change that has been made is the substitution of ball joints for the universal joints formerly used in the steering connections. The motor of the little six is 4 by 5, cast in threes, but otherwise similar to the larger motor. The circulating splash system of lubrication is used, in connection with a gear pump. The splash-troughs have been cast so that oil is assured each cylinder at all grades under 27 per cent.

Inclosed valves are used on this model, and the push-rods are fitted with roller cam bearings. While forced circulation of water is used, the cooling system is so arranged that in case of pump failure, the circulation will continue on the thermo-syphon plan. The Remy lighting system starter is installed. Standard body types are listed, with complete equipment.

POPE-HARTFORD

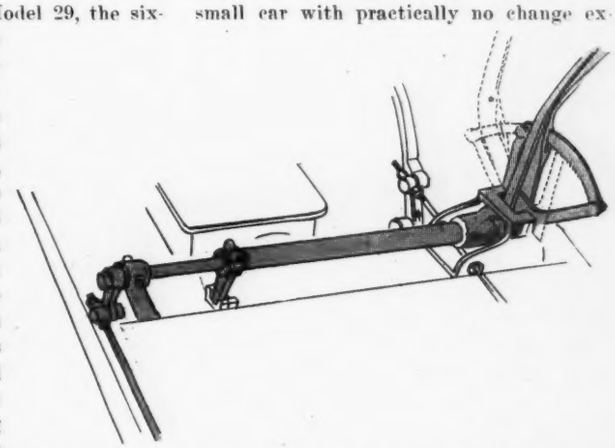
RECENT extensive additions to the Pope-Hartford factory have enabled the Pope Mfg. Co. to increase both its output, and the number of models produced. For 1913, three chassis will be manufactured, a continued six and four and a new light four. Model 29, the six-cylinder car, has been slightly condensed in the principal proportions. The wheelbase has been shortened from 134 inches to 133, and the tires, which are 37 by 5 this year, last year were 38 by 4½ and 39 by 5, front and rear, respectively. Otherwise, few mechanical changes have been made. The frame has been lowered slightly, and double-dropped narrowed at the front, permitting a shorter turning radius A new selective roller-bearing gearset has been fitted, affording four speeds, and the rear axle has been redesigned and fitted with roller bearings throughout. The bodies have been revamped, in conformance with the popular ideals, comprising seven styles of body types in all for this chassis.

The four, carried over from 1912, known as model 33, has undergone no essential change, except in body designs, which have been brought up to date. The new model, known as the 31, follows the principles of design laid down by its predecessors, being of four cylinders cast in pairs, $4\frac{5}{16}$ by $5\frac{1}{8}$, bore and stroke, with the valves side by side in the head. The Pope four-tooth starting ratchet is used in this model as well as in others. The carbureter is of Pope design, and high-tension dual ignition is used. The cork-inserted, leather-faced cone clutch, fitted with a clutch brake, the four-speed selective roller-bearing gearset and inclosed propeller shaft to the floating axle are all characteristic features that have been perpetuated in the junior of the Pope family. No radius rods are used in this model, however, propulsion being through the springs, and to a certain extent through the torsion tube.

The frame construction is a reproduction of that employed in other models, on a small scale. The wheelbase is 118 inches, and the tires 36 by 4½. The body is of sheet metal, with a moderate cowl dash and simple body panelling. A special feature is the tool box, which is of metal, and secured to the rear of the body, beneath the frame. All models are equipped with the Gray & Davis electric starting and lighting system. The starting motor is mounted beneath the body, and drives the toothed flywheel, while the generator is driven from the timing gears of the engine. The battery is carried in a cradle beneath the tonneau floor, accessible from above.

PAIGE

PAIGE cars will enter the 1913 season with two four-cylinder chassis models. To do this its maker has continued its small car with practically no change ex-



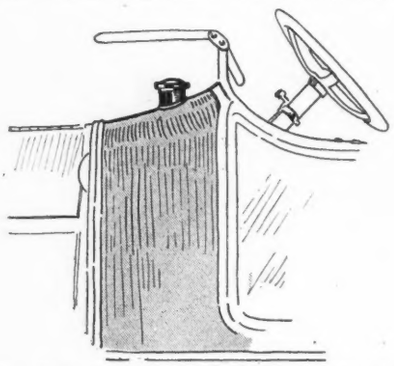
Reversible gearshaft control segment which adapts same Pathfinder chassis to limousine or racing body, and accessible brake adjustments

cept the lengthening of the wheelbase from 104 to 110 inches, and has added another model called the 36. The older model 25 has a 3¾ by 4-inch motor, while the new type has a 4 by 5-inch motor. Both are of the monoblock-cast type, with L-heads. Cooling of the new motor is by centrifugal pump circulation, while the smaller engine is cooled by thermo-syphon. The power plants are both of the unit type, the three-speed gearsets being a part of the crankcases. The new 36 is provided with left-hand control, and has Gray & Davis starting and lighting systems.

Silent chains replace gears in the motor for driving camshaft, pump and generator. The rear axle is floating, rear springs elliptic, while a special feature of the design is the location of the gasoline tank at the dash and under the shroud. The wheelbase is 116 inches. Seven bodies may be had on the model 25 chassis, while the 36 can be furnished with five. The price on the standard five-passenger touring car and the three-passenger roadster types on model 25 has been reduced. For the 36 roadster and touring car types, the price is set slightly higher. All dash equipment on the latter has been imbedded in the auxiliary dash and convenient to the driver. Running boards are clear. Equipment is complete and all trimmings are in nickel.

PULLMAN

TWO fours and one six are announced as the Pullman line for 1913. The complete line is composed of models 4-30, 4-40, and 6-60. Heavy wrist pins will be discarded in all the products of the Pullman company and a much lighter pin used. Though the steering wheels on the 1912 models were of standard size, still the wheel diameter has been increased on the 1913 models. Another improvement worthy of note is a carbureter primer accessible from the driver's seat. Particular attention has been paid to the refinements of the 4-40 and 6-60. These models are equipped with a crank case bottom much larger than heretofore used, thus increasing the oil reservoir capacity. The increased length of the springs, larger bearings on the camshafts, water pump shaft and magneto shaft all tend to make the motor more substantial. The chain driven Vesta lighting system and the Ever-ready starter bring the Pullman models toward the full equipment goal. Although these contrivances are a part of the standard equipment the company will install any other equipment desired.

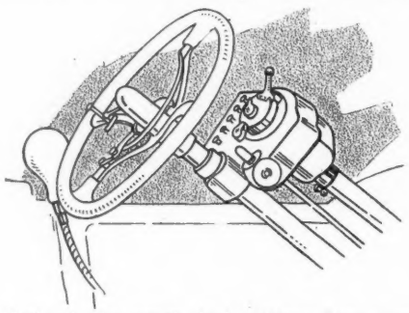


New Paige has flush dash lights tank in cowl dash, and integral windshield

PEERLESS

PIONEERS in 1913 announcements, the Peerless company produces for the new year five models, whose features differ from former productions only in refined detail, as yearly models are contrary to the manufacturing policy of this company. The Bosch double-dual system, tried out in the 1912 cars has been discarded in favor of the simple dual system for reasons of simplicity. The piston throttle valve formerly used has been abandoned in favor of the damper type. The Gray & Davis lighting generator is now driven from the fanshaft, instead of from the pump shaft, and operates at higher speed.

A unique arrangement is provided to prevent loss of oil through leaving the oil drains in the crankcase open. This consists of a lever linkage which makes it impossible to close down the hood with the oil petcocks open. A small force pump on the dash is provided to prime the motor by drawing gasoline from the float-chamber and spraying it into the valve-chambers. The models are designated 38, 48, 60, all sixes, and 24 and 40, fours. The Gray & Davis lighting and starting system is regular equipment on all models.



Most of the usual dash fittings have been moved to this control board on Packard 38

PATHFINDER

NO RADICAL changes have been made in the Pathfinder cars, although two body types have been added to the four carried in 1912. These cars are produced on the series plan, the 1913 production being known as series XIII. The wheelbase has been increased from 118 to 120 inches, and the tires from 34 by 4 to 36 by 4½. The motor is the same Continental, 4⅛ by 5¼, that was used last year, and the same cone clutch and three-speed selective gearset. The rear axle is of the three-quarters floating type, with the torsion tube separate from the shaft. The specially designed Pathfinder chariot wheels are retained, but on special order, wire wheels will be fitted.

The feature of the 1913 series is the Gray & Davis electric lighting and starting system, which is optional on all but the coach model, with which it is included. The body types in all consist of a roadster, phaeton, touring car and Martha Washington coach, last year's continuations, a new speed model styled the cruiser, and a limousine. The cruiser is an exceptionally low-sided two-passenger body with high backs to the seats, and seats practically on the floor. A long tapering streamline stern serves to carry out the speedy impression and to provide a commodious storage space.

PATERSON

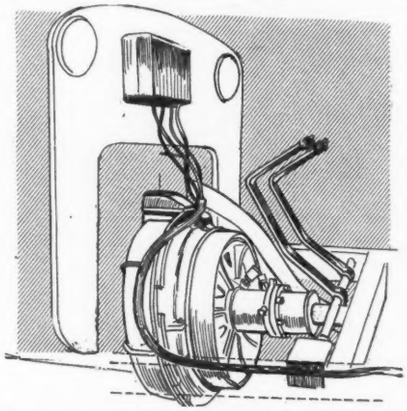
FOUR models, comprising two chassis, constitute the 1913 line of the W. A. Paterson Co. On the smaller chassis is built model 43, 43-A and 41, identical except in equipment. On the larger chassis is built model 47. The chassis of model 43 has a motor of four cylinders, 4⅛ by 4¾, cast in pairs, with valves on the left side. Their mechanisms are fully inclosed, and the motor, flywheel, clutch and gearset are assembled as a unit.

The clutch is of the cone type, and the gearset provides three speeds forward and one reverse. An electric lighting and starting device is installed, and demountable rims. The rear axle is of the floating type, and the wheelbase is 116 inches, and the tires 34 by 4. Type 47 has a motor 4½ by 5¼ and a wheelbase of 122 inches, with 36 by 4-inch tires.

REGAL

THREE chassis are offered for 1913 by the Regal company, two of which are underslung, and one of which, a new production, is overhung. Overhung cars were discontinued in 1912 by the Regal company, the Regal line being exclusively underslung, but their manufacture was resumed for 1913 in response to a demand for a car of the type the Regal represents by those who did not favor the underslung principle of suspension. The new model, styled model S, is a five-passenger touring car. A new motor has been designed for this model, and the body is of a type new to Regal practice.

Models H, T and N, the continued underslungs, show little change from former construction, as radical changes and yearly models are counter to the Regal policy. The new model is provided with a four-cylinder block motor, with cylinders 4 by



U. S. L. lighting and starting dynamo, new cone clutch, and flush lights on Rambler

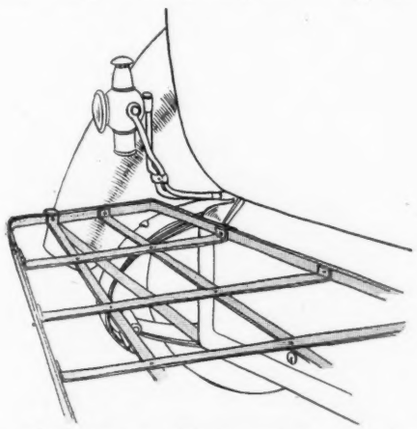
5. The crankshaft is carried on three bearings, valves are all on one side, and dual ignition is used. Motors on former models are suspended from a tubular subframe, while that of the new car is suspended direct from the chassis frame by integral arms.

REO

NO radical changes have been made in Reo the Fifth, although tires have been made larger, and the lines of the bodies improved. The motor, 4 by 4½ inches, with the inlets in the head, and exhaust valves at the side, has been continued without change. The center-controlled gearset and two-pedal brake control, in which the left pedal controls the clutch and primary brake, and the right pedal the emergency brake, is retained in the new series. An important change that has been made is the elimination of the torsion tube inclosing the shaft. The torque member is now external of the shaft, and the shaft is provided with two universal joints instead of one.

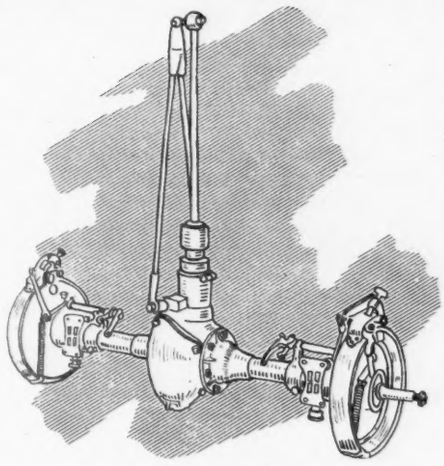
RAMBLER

ONLY one chassis will be produced at Kenosha for 1913, this, the Cross-Country model. This model was new last season, and uses the same motor as last year, the only difference being in the substitution of a Stromberg carbureter for the Holley formerly used, and the application of a U. S. L. electric lighting, starting and ignition system.



Three-quarters elliptic springs, tool box, trunk rack, and tail lamp on new Stevens-Duryea six

This system is different from the usual form of devices of this character, in that the motor-generator employed is not an accessory to the engine but a part of it, taking the place of the flywheel. This application permits the use of a large and efficient dynamo, without exceeding materially to the weight of the engine with the flywheel. Simplicity also results, as the generous size of the motor-generator makes it possible to use it as a starting motor, direct, without gearing, and the magneto is dispensed with, current being furnished for this purpose at 12 volts by the generator. The battery is charged at 12 volts, current for starting is taken in direct series, and for lighting on the three-wire plan at 6 volts. Proper charging of the battery is cared for by an automatic regulator on the dash. The only change in the motor other than these is in the use of a mechanical oiler as auxiliary to the regular splash system.

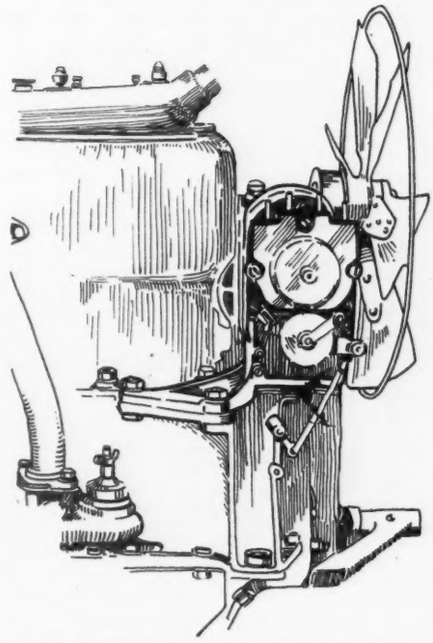


Reo rear axle and tubular torque arm

The expanding clutch which has characterized the Rambler in the past is this year discarded in favor of the simpler cone type. The leverage on the gearset control has been reduced, to shorten the necessary length of movement of the control lever. Bodies fitted to this chassis are a four-passenger and a five-passenger touring, a two-passenger roadster, a four-passenger sedan and the Gotham limousine.

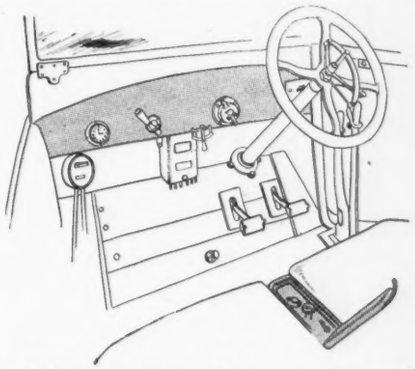
REPUBLIC

HERETOFORE Republic cars have appeared in a single chassis, continued from year to year with minor refinements, on the series plan, and not recognizing change of season. Following the latter policy, but abandoning the first custom, the Republic D appears in the 1913 market little different from a year ago. But it is no longer to carry the Republic nameplate alone, a new six, model E, having been added to the production of the Hamilton, Ohio, makers.



Transverse magneto drive in front of Studebaker motors which affords protection and accessibility to this member

The only change in the four for 1913 is the adoption of the Delco system and introduction of cork inserts in the leather-faced cone clutch. A new roadster will be fitted to this model, having a trundle auxiliary seat which is concealed beneath the seats, and which pulls out over the running board for the accommodation of an extra passenger. Tires 34 by 4 are fitted to this model instead of the 36 by 4-inch tires fitted to the regular model. The new six follows the characteristic features of the four very closely the same bore and stroke of 4¼ by 5, cylinders cast in pairs, with valves on opposite sides, Delco ignition, starting and lighting, Stromberg carbureter, and cone clutch. It differs, however, in the gasoline tank, carried under the seat of the four, is located in the rear of the six and feeds by pressure instead of gravity.



Dash of new Stevens-Duryea, showing inside levers, electric horn button on door, and gasoline gauge and cock between seats

The gearset has been moved from the rear axle to middle of the car on the new six, while still carried on the axle by the four. Four speeds are provided, and propulsion from the floating axle is through the springs, instead of the radius rods made necessary by the extra axle weight imposed by the gearset on the four. The wheelbase of the four is 120 inches, and that of the six 132. The tires on the four are 36 by 4 and 34 by 4, while on the six they are 36 by 4½. Left-hand steering is a feature on the six, the same center control as used on the four being employed. While the power of the six is 50 per cent greater than that of the four, it weighs but 500 pounds more.

RICHMOND

LARGER cars are being produced by the Wayne Works for 1913 than for 1912. The same 30 and 40-horsepower motors, of 4 by 4½ and 4½ by 5 are used. These motors are of four individually cast cylinders. The valves are located in side pockets on the left side, their springs and lifters inclosed in telescopic tubes. The crankshaft is supported on five bearings.

The clutch is of the inverted-cone type with a bronze ring thrust, so arranged that it is bathed in grease upon pressure being applied on it, permitting slippage of the clutch with no harmful results. The three-speed gearset is located behind the clutch, to which it is coupled by a universal joint.

Thermo-syphon cooling, formerly supplied on the 40 only, is now provided on both models, and the tubular type of radiator is used. The former dual ignition system has given place to single magneto ignition. A change to Schebler carbureters has been made, and the wheelbase and tire sizes on both models enlarged. Model O, formerly model N, has a wheelbase increased from 106 to 112, and tires from 32 by 3½ to 34 by 3½-inch tires. Model P, formerly model M, has a wheelbase of 120 instead of 112, and tires 36 by 4 instead of 34 by 4. Springs have likewise increased slightly in length. Model P, the 40-horsepower model, is equipped with electric lights, supplied by a dynamo and storage battery. Model O is fitted with an improved fore-door touring car and a Bumblebee roadster. Model P carries a touring car only.

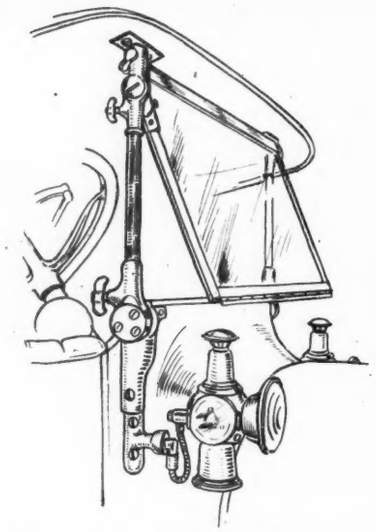
R. C. H.

NO mechanical changes have been made in the R. C. H. for 1913, with the exception of a lever to control the emergency brake, instead of the former pedal, and the mounting of the spark and throttle levers on the steering column, just below the steering wheel. The feature of the new series is equipment. Electric lights, with a 100 ampere-hour battery, top, envelope, jiffy curtains, demountable rims, with one spare and holder, rear-view mirror, speedometer, windshield, and horn being included as regular equipment.

STODDARD-DAYTON

FIVE models of Stoddard-Dayton cars will be produced by the United States Motor Car Co. for the present season. The six-cylinder Knight-motored car is, of course, the leader, while but one of the characteristic valve-in-the-head Stoddard-Dayton motors remains. Two smaller cars now use the L-head type of engine. Beginning with the sleeve-valve six, this car is fitted with left-hand drive and center control, as last year's model was, and offers the option of wire wheels.

Changes have been made in the design of the front axle, a new type of worm and sector steering gear is used, the radiator has been enlarged, new wheel-hub bearings have been fitted, and the control has been simplified. Model 48 is the only remaining model using the valve-in-the-head motor. It remains the same as last year in mechanical features, except as minor details have been refined. The two L-head models, 30 and 38, use engines cast in block, with valve mechanisms inclosed, and show little deviation from former practices. All standard body types are fitted on each chassis, with the exception of the 30, which takes a five-passenger



Stevens-Duryea dash, showing integral windshield and lamp brackets, with top supports on side pillars

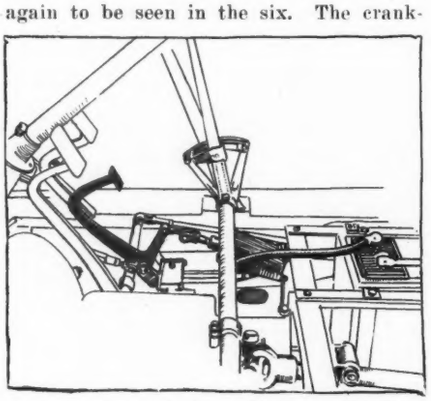
touring and two-passenger roadster only. All body types have undergone refinement.

In addition to the above offering a chassis with a 139-inch wheelbase, upon which is mounted a six cylinder Knight type motor is produced. This motor will be identical with the one of 1912 in every respect, with the exception of the lubrication system. The Stoddard-Dayton company is contemplating a change in this particular.

STUTZ

ANNOUNCEMENT was made late last fall of a new Stutz model with six cylinders, which, as a 1913 model, is added to the output of fours of the Indianapolis factory. The Ideal Motor Car Co. is not an exponent of yearly models, and the original Stutz is to be continued for 1913 with only such changes as are consistent with logical development. The six was developed along the lines laid out by the four, although of larger dimensions and altered proportions to adapt it to the six-cylinder motor.

With cylinders 4¼ by 5, valves on opposite sides and cylinders cast in pairs, the design is of a conservative character. The hollow crankshaft oiling system, which has proved so successful in the fours, is again to be seen in the six. The crankshaft is carried on four bearings. Ignition and carburetion are accomplished by the Eisemann dual system and Stromberg carbureter, respectively, while the roadster model will be equipped with a Splitdorf ignition system for high-speed work. A disk clutch and the Stutz rear-axle gearset system. The car has a 130-inch wheelbase with the six-passenger body, and a 124-inch wheelbase on the roadster. Tires are 34 by 4½ all around on all models.



G. & D. electric starter, battery, and operating mechanism on Stearns six

Series B of the Stutz four departs very little from former practice. The chassis shows no changes except that the intake is made of copper and waterjacketed, to warm the incoming charge, prevent condensation and facilitate starting. Ignition on the touring and runabout models of the four are the same respectively as on the sixes, but the choice of carbureters is optional with the purchaser. Stutz bodies for 1913 include six-passenger bodies for both models, Bearcat roadsters for both models and a four-passenger car for the four. No five-passenger bodies are built because of the unsightliness of the wide tonneaux essential to such arrangements. The Stutz rear system has been redesigned for the Series B, and a larger rear axle provided with an outside adjustment of the driving pinion installed. The Esterline electric lighting and charging generator is installed on all Stutz cars. An additional equipment consists of a full set of auxiliary coil springs. Both models are listed with a full equipment. A special feature that has been added to Stutz cars is the option of wire wheels for those who prefer.

STEARNS-KNIGHT

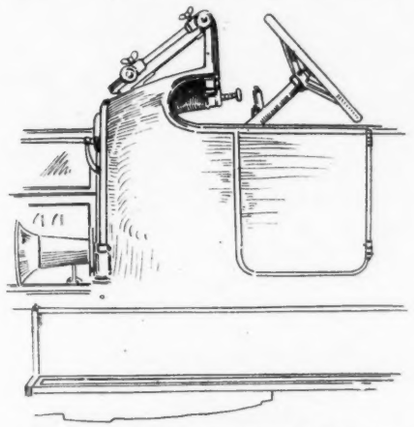
ALTHOUGH continuing its Knight-type motor practically unchanged since its adoption a little over a year ago, the F. B. Stearns Co. has just announced a six-cylinder Knight motor equipped car. The bore of the six-cylinder car is the same as the four, 4½ inches, while the stroke is ¼ inch longer, 5¾ inches.

This new Knight creation adheres to the design principles which have been so carefully worked out for the earlier type in most respects, although a few departures are noticeable. The front end of the new motor is hung on an arched crosspiece, bolted to the side-rails of the frame, replacing the aluminum arm construction usually employed. A separate cross-member supports the radiator. The rear end of the motor is bolted to the side members of the frame by integral crankcase arms. A four-speed gearset is used, while final drive is through a propeller shaft equipped with two universal joints. Gray & Davis starting and lighting systems are fitted as standard equipment on the sixes.

The new chassis is made in two lengths, having 134 and 140-inch wheelbases, for which body styles are provided. The 134-inch wheelbase takes the three-passenger roadster, four-passenger light touring, and five-passenger touring bodies, while the

140-inch wheelbase carries the seven-passenger touring type. Landaulet and limousine bodies are furnished for either chassis. The touring-car bodies are all flush-sided with a narrow moulding around the bodies and doors. Running-boards are clear, tires being carried at the rear on special brackets. Equipment is complete in every respect.

The four-cylinder model is continued in



Novel form of dash on Stearns-Knight six, showing integral windshield

series, unchanged since its adoption in July, 1911. All changes that have been made are in the bodies. The straight-line flush-sided body has been given preference over the individual-panel type formerly used. The lines have been cleaned up, and the upholstery deepened. A special feature is a small latch to retain the forward-opening front door partly open for ventilating purposes. This is also found in the six-cylinder open cars. The equipment has been amplified to include electric light, and an ever-ready mechanical starter. A full line of bodies, as in the 1912 models, is carried by this chassis.

SPEEDWELL

MEAD rotary-valve motors will be installed on the new Speedwell cars at the customers option. This is the most notable feature of the 1913 Speedwell propaganda. Series G of Speedwell cars are, as always has been Speedwell custom, in but one chassis model. Unlike former Speedwell cars, however, the new series will have six cylinders, although the general chassis features will show no radical departures. The new motor is of 4⅛ bore by 5¼ stroke, with all valves on the left side, with fully inclosed valve-mechanisms, and supported on three points. The unit power plant idea is carried out in this car, the gearset being bolted rigidly to the motor.

Only a limited number of non-poppet engines will be produced for the present season, but for next year, an extensive production is planned.

The only differences in the motors are in details relating to the different valve constructions. Both motors are of the four-cycle type. The valves of the Mead engine are in the form of slots in rotary cylinders, located at the two top edges of the motor. These are disposed opposite ports in the cylinder heads, surrounded by water-jacketed casings. The cylinders are cast in blocks of three, the valve-cylinders being four in number, connected with universal joints, and chain-driven.

The Apleo electric starting and lighting system is used, ignition being by the Bosch dual system, independent of the starter. A dry multiple-disk clutch is used. Center levers have heretofore been used in Speedwell cars in connection with right-hand drive, but this year the steering wheel has been moved to the left side. The propeller shaft is of Spicer design, while Timken axles are used. The wheelbase is 135 inches, and tires are 36 by 4½ on all models except the seven-passenger types, which use 37 by 5-inch tires to allow for the extra weight.

Three-quarters elliptic springs are used in the rear, and the body design is entirely new. The doors are set close together, and the dash cowl is deep, with an integral windshield. New features are adjustable foot-pedals, lockers under the cowl, all doors operative and provided with pockets, arm rests on auxiliary seats clean running boards and new fender design, gasoline tank in the rear with pressure feed and complete equipment. In spite of the evidently improved character of the car, the price remains the same as formerly.

SPAULDING

IN the third year of motor car manufacture, the Spaulding Mfg. Co., Grinnell, Ia., expects to greatly increase its production for 1913. The Spaulding is designed along recognized and conservative lines, and has been little modified in its 1913 model. The small model has been dropped, and the large one continued. The principal changes that have been made are the installation of the Gray & Davis electric lighting and starting system; an electric heating system; left-hand drive and center control; demountable rims, with a spare; a tire-holder in the rear; and modifications in the motor size.

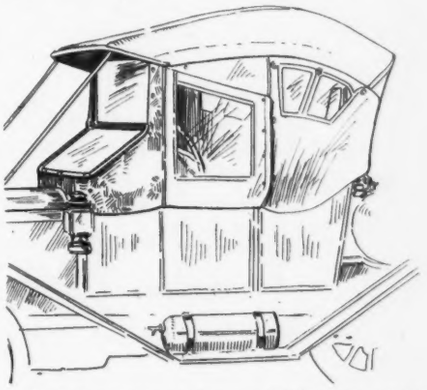
The motor has been changed from 4⅛ by 5¼ to 4¼ by 5½; modifications are to be noticed in the oiling system, the valve-mechanisms have been inclosed, and the intake manifold is now cast integral with the cylinders, which are this year cast in block, instead of separate as formerly. A pressed steel rear axle of the floating type is used. The wheelbase is 120 inches, and the tires 36 by 4, instead of the corresponding dimensions of 117 and 34 inches of last year. The upholstery has been deepened, the springs lengthened and the general tone of the car is more luxurious than formerly. Equipment is complete.

STEVENS-DURYEA

RADICAL changes are announced in the Stevens-Duryea product for the first time in several years, for the new season. The most noticeable alterations are in the structural outline. The former straight hood, with the abrupt dash break, has been cast aside in favor of the European idea of continuous lines from the radiator to the tire-holders, the contour of the hood merging into the body lines through the medium of a scuttle dash. To this dash is secured an integral windshield, and a panel board upon which all gauges, switches and fittings are placed.

Between the front seat is a small compartment in which the gasoline gauge and shut-off are located. This compartment may be locked, with the gasoline turned off, thus preventing theft of the car. The rear seat is adjustable for angle and height, by means of a small knob.

Mechanical changes are the abandonment of the platform spring formerly used, for the three-quarters elliptic type, which is provided with dampening leaves. The power of the six-cylinder motor has been increased, although the over all length has been shortened. Last year, in addition to the abandoned four, there were two sixes, 4¼ by 4¾ and 4¾ by 5½ respectively. This year there is but one motor for two chassis of different wheelbases, 4 5/16 by 5½.

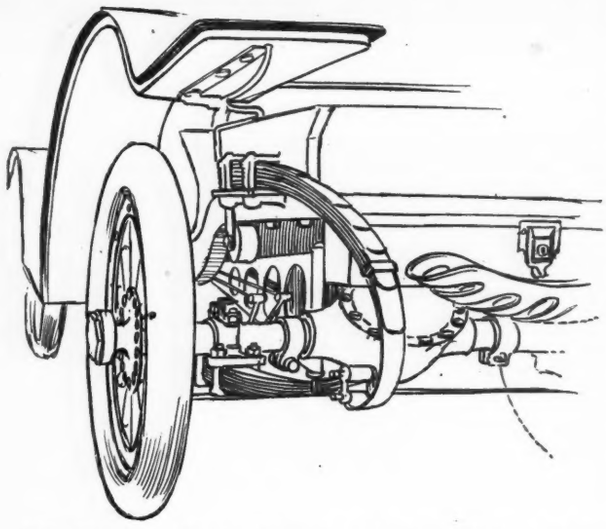


Curtain carrier on door of Studebaker, which makes the door as tight and yet convenient as a limousine door

The new motor follows Stevens-Duryea practice in general, but is much more compact than former productions, although accessibility has not been sacrificed. A new oiling system, of greater simplicity and compactness, has been adopted, and a Disco acetylene starter installed. The wheelbases on the two models are 131 and 138 inches, respectively, the first being equipped with 37 by 4½ tires all around, while the other has this size in front and 37 by 5 in the rear. Three-quarters elliptic springs were used on the 1912 light six for the first time in Stevens practice, but are to be found. Seven body styles are furnished on the 131-inch wheelbase and four on the 138-inch.

S. G. V.

ABANDONMENT of gravity fuel feed on model A and the substitution of a pressure feed system is the only change of note in S. G. V. construction for 1913. Otherwise the 1912 car is carried over. Model D already had a pump-actuated pressure



Velie Dispatch with underslung three-quarters elliptic springs, tool box, tire holder, and pressed steel torque-arm in rear construction

system. The function is worked out in Model A through pressure derived from the exhaust. The company has announced that the sixteen styles of bodies furnished last year will be continued, although several changes have been made in body construction to conform with current practice.

STUDEBAKER

IN addition to its models 20 and 30, which were formerly known as the Flanders and E-M-F, respectively, the Studebaker Corporation has brought out three new types, two fours and a six, swelling the chassis models to five. Few mechanical changes have been made in the older types. The bore and stroke of the 30 are 4 by 4½ inches, and of the 20 3⅝ by 3¾ inches. The former has its cylinders cast in pairs while the latter is a monoblock-constructed power plant. Bodies on these cars have advanced with the trend in motor car construction, nevertheless they retain the general appearance which has characterized these cars since their inception some 5 years ago.

As to the new models, which are known as models 25, 35 and six, have horsepower ratings of 26, 35 and 45 horsepower, respectively. There are two motor sizes, the smaller four, model 25, and the six having a bore of 3½ inches and stroke of 5 inches, while the larger four has dimensions of 4⅛ by 5 inches. Cylinders are cast in block in all three of the newcomers, all valves being on the left. Carbureters are on the opposite side of the motors from the valves, the gas being led through the cylinder castings to the left side, then to the valve chambers. The principal reason for doing this was to virtually hot water-jacket the intake manifold and to assist in vaporization of fuel.

Another departure is the placing of a transverse shaft at the front of the power plant, the magneto being mounted at one end of this cross shaft and the pump at the other. The gearing connecting with the crankshaft gearing is at the center of this shaft. Except for differences in wheelbase, the design of the six-cylinder chassis and that of the larger of the new fours is the same.

Some variations from these two are found in the smaller of the new fours. The smaller car has its drive shaft inclosed in a torque tube, while the other two types have their propeller shafts exposed, torque arms running back to the rear axles and parallel to the shafts. Gearsets are located in unit with the rear axles, while a semi-floating rear axle is found on model 25 and a floating type on models 35 and six.

Standard bodies for the new cars consist of a four-passenger type for model 25 and six-passenger designs for the other two. On these latter a Wagner electric starting system is used, and although the other model has no starter, it is equipped with an acetylene primer which facilitates starting in cold weather. Clean running boards, curved backs and low angle cowl dashes are some of the features which are noticeable in connection with the body designs.

SIMPLEX

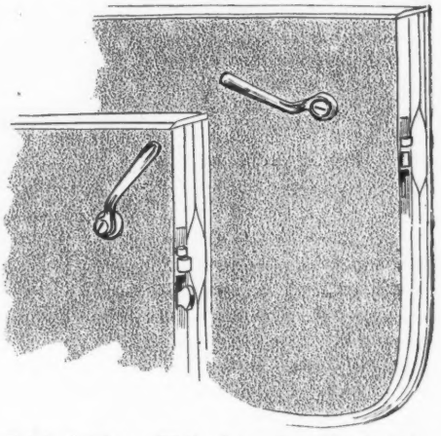
AS BEFORE, the Simplex Automobile Co. will produce three chassis with bodies to order. All of the chassis offered last year are continued with no mechanical alterations whatever, although a generator electric lighting system has been installed in all models. In addition to these three, the Simplex company announces a chassis practically identical with Louis Disbrow's Simplex Zip which has been installed in the line. This model has flat springs and sets much closer to the ground than former Simplex productions, in conformance with racing requirements.

The cylinders, four in number, are 5¾ inches square, and while this engine is allowed 53-horsepower by the S. A. E. rating, it is said to develop 90 on the brake. This model is chain-drive, and will be furnished either as a chassis or in a racy two-passenger roadster.

It will be remembered that the other models are a 38-horsepower, shaft-driven chassis with a 4⅞ by 6½-inch motor and two wheelbases, 127 and 137 inches, respectively; and a 50-horsepower, chain-driven chassis, with four cylinders 5¾ square. This chassis has wheelbases 129 and 139 inches, respectively. While the bore and stroke of this motor is the same as the new model, the latter motor differs in design, notably in the size of the valves, which are the same as used in the 90-horsepower model, thus deriving its additional power. The new model is termed the 75.

SELDEN

IN conformance with its previous manner of production, the Selden enters the 1913 market with a single chassis, continued with few changes from former years. The effort that has been expended on the new series has been directed towards development of the design, in close adherence to former ideals. The Selden four-cylinder motor is practically unchanged, while the dry multiple-disk clutch, adopted last year has undergone no modifications. The principle changes are in the rear axle and in the use of the Gray & Davis starting system, in addition to the lighting system formerly employed. The brakes formerly both internal 14 by 1¾ inches, have been changed. The service brake operates on the outside of the same drum on which the internal emergency brake operates.

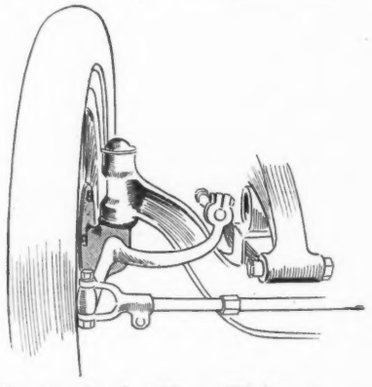


Safety latch on White doors, to assist lock in standing unusual strains

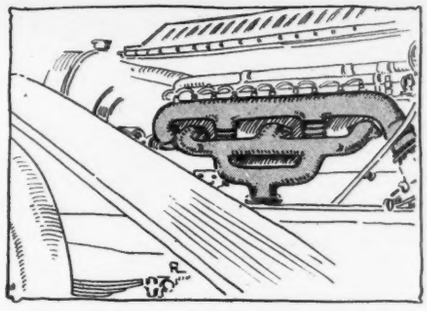
The size of each has been increased to 16 by 2 inches. Five body styles will be furnished on this chassis, consisting of a roadster, three touring cars and a limousine.

STAVER

FOUR Stavers will appear in the 1913 market, the 55 five-passenger four-cylinder model, 55 four-passenger car, the 45 five-passenger four-cylinder car, and the six-65 six-passenger six-cylinder car. All



New steering knuckle on Winton six



Manifolds on new Warren six-cylinder model

cars will be electrically lighted, and models 45 and six-65 will have left-hand steer. Change from the compressed air to the electric type of starter is expected, but not definitely announced.

No change is made in the new series of models 55, but in the 45 and six-65 small refinements are to be noticed throughout the car, and the left-hand placing of the steering wheel has necessitated moving the control levers to the center of the car. The equipment on all models is complete.

TOURAINE

TURNED out by the Nance Motors Co., of Philadelphia, the Touraine six is a new model. The car has a motor measuring 4 by 5½ inches, rated at 38-horsepower, S. A. E. formula, but testing 61-horsepower at 2,220 revolutions. The cylinders, of the T-head type, are cast in threes. Lubrication is by self-contained circulatory system with the reservoir in base of motor. A double-jet carbureter is used with a claimed mileage of from 10 to 16 miles to the gallon. High-tension magneto supplies the ignition. Alloy steel is used throughout the gearset, which is of the sliding selective type. Straight-line drive to full floating rear axle is followed. The front axle is a nickel-steel drop-forged I-beam.

The brakes operate upon drums 16⅝ inches in diameter, and are equalized and compensated. The steering gear is of the worm and gear type. The frame is of channel steel section with six cross members, offset in front to allow short turning. The frame is 22½ inches from the ground. Wood wheels 34 or 36 inches with demountable rims or wire wheels of the same size are furnished optionally. The car is made in three lengths of wheelbase, 134, 124 and 112 inches, respectively.

VELIE

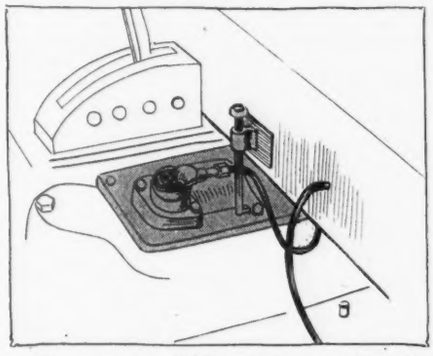
TWO new models and one continuation are announced as the Velie line for the new season. These models are model 40, model 32 and the Velie Despatch respectively. Model 40 is the successor to this year's model M and is in its fourth successive year. The Despatch is an improved model 32, while the 32 is continued this year with only slight changes over former practice.

The principal changes to be noted are the adoption of the Gray & Davis electric lighting system and left-hand drive on model 40. Silent chains have been substituted for gears in the camshaft drive for each of the new models, the magneto being driven by worm gears on a transverse shaft, the new position being notable for its accessibility. A patented clutch adjustment and automatic pressure gasoline feed are detail refinements that have been made.

The valves on the new models are inclosed and the carbureter is mounted on the right side, a long pipe connecting it to the manifold on the left side. This pipe passes over the motor and exhaust pipe, thereby warming the mixture somewhat before reaching the valves. Body types include touring cars and runabouts listed with complete equipment.

WHITE

MONOBLOCK castings and long strokes are characteristic of White gasoline productions, and constitute features of all three of the White models for 1913. The



Tire pump on White six is a part of the gearset. It is controlled by a button, and has a connection on the seat front

White six, brought out early in the 1912 season, is continued for 1913 with only slight modifications. Models 30 and 40, of last season are continued this year on the series production plan. Model 30 has been redesigned for left-hand drive, the valves being placed on the right side, instead of the left as formerly. Oil circulation formerly was effected by a horizontal pump in the crankcase oil well, but is now maintained by a vertical pump at the side of the motor, as in the 40. The starter has been moved from the right side to the left, and the body lines have been refined, so that the 30 body now resembles, on a smaller scale that of the six. Model 40 has practically no changes. The six has a new air pump on the gear-set that is controlled by a small handle convenient to the driver. These models are, in their order mentioned, models GF, GRE, and GEB. The six has its cylinders in a single casting, all valves on the right side, with inclosed mechanisms, and 4¼ by 5¾ bore and stroke.

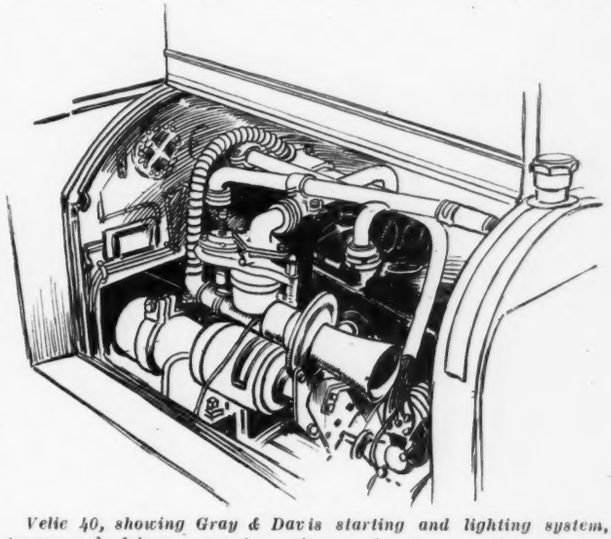
Three ball bearings are used as engine journals, and both manifolds are integral with the cylinders. This with conduited wires and concealed water passages imparts a pleasingly clean appearance to the motor. Two fans are used in connection with the pump-circulated water cooling system, one of which is behind the radiator, and the other the vaned flywheel. A carbureter of White design is used, and a compression-relief is fitted for starting.

Single magneto ignition is made practicable in so large a motor by the use of an electric starter. The latter is a part of the White electric lighting and starting system, which is of the single-unit type, the dynamo fulfilling both the functions of a motor and a generator for charging the battery. General chassis details on the six differ only in dimensions from the other models. Body types include touring cars, landaulets, limousines, and Berline limousines.

WARREN

CONTINUING its three four-cylinder models and adding a six-cylinder type, the Warren Motor Co. enters the 1913 selling season well equipped to meet the demands of all comers. All three of the fours have different cylinder dimensions, none of which correspond to those of the new six, which has a bore of 4 inches and a stroke of 5 inches. The fours are identical in all but the most minor details with their counterparts for last season.

The six adheres to the monoblock cylinder construction, the upper part of the waterjacket being cast open. It is covered by an aluminum plate with which the water outlet is formed integrally. The new motor, like the Warren fours, is of the L-head type, valves being located on the left. The crankshaft has three bearings which are anchored to the upper half of the crankcase in the usual way. The support of the engine is at four points on



Velie 40, showing Gray & Davis starting and lighting system, transversely-driven magneto, unique carbureter mounting and connections, and concealed electric signal

a subframe. Splash lubrication, positive water cooling, double ignition and pressure gasoline feed are features of the six power plant. It also is fitted with an electric self-starting and lighting system of the Northeast make.

The combined motor-generator is mounted on the right side of the engine and connects to the crankshaft by a 1-inch silent chain.

WINTON

SINGLE chassis continue as the product of the Winton Motor Carriage Co., the six-48 being announced for 1913 with few changes over last year's production. The alterations for 1913 include ¾ elliptic rear springs for the first time in Winton practice, 11-inch upholstery, and windshield integral with the body, the placing of the steering arm above instead of below the front axle, and the offering of either a Bosch or an Eisemann magneto. The car is in general, of six cylinders, cast in pairs, with all valves on the right side. The multiple-disk clutch has long been a feature of Winton design, while the four-speed gearset and pneumatic-type starter the oldest starters in the country are adhered to with tenacity.

A new steering knuckle has been adopted in which the axle bearings are above the wheel spindle, as shown herewith.

WESTCOTT

IN line with the present trend in favor of light, medium-priced sixes, the Westcott Motor Car Co. announces a six in addition to its continued four. The four differs little from its predecessors, the chief change in mechanical features being the installation of an electric starting and illumination system. The six-cylinder is one of the bountiful harvest of new sixes appearing for 1913. An aim has been made in its manufacture to effect simplification of structural features, following the same general lines laid out in the four-cylinder cars. The motor is cast in block, 4½ by 5 bore and stroke, with valves arranged opposite, instead of in an L-head, as previously. The car is claimed to develop 67 horsepower, and to weigh 3,500 pounds, or to have 1 horsepower to every been refined and are furnished at their 52 pounds in weight. Body types have prices with complete equipment.

Six-Cylinder Motor One of 1913 Features

One-Half of American Makers Producing Sixes—More Than a Third of the New Models Are of This Type—Tabulations Showing Bore and Stroke

NEW SIX-CYLINDER MOTORS

NAME OF CAR	BORE INCHES	STROKE INCHES	NAME OF CAR	BORE INCHES	STROKE INCHES	NAME OF CAR	BORE INCHES	STROKE INCHES
A. E. C.	3.75	5.50	Holly	4.00	5.00	Nyberg	3.75	6.00
A. E. C.	4.25	5.00	Interstate	4.00	5.00	Nyberg	4.25	5.25
Alpena	3.75	5.25	Jackson	4.13	4.75	Oakland	4.13	4.75
Amplex	4.13	5.25	Keeton	3.75	5.50	Oldsmobile	4.13	4.75
Burg	3.75	5.25	Kisselkar	4.50	5.25	Packard	4.00	4.50
Burg	4.13	5.25	Knox	4.38	5.50	Pierce-Arrow	4.00	5.50
Carroll	4.13	5.25	Knox	5.00	5.50	Pilot	4.00	6.00
Chevrolet	3.55	5.00	Lenox	4.00	5.00	Premier	4.00	5.00
Colby	4.13	5.25	Lexington	4.13	5.25	Rayfield	3.50	5.50
Cole	4.13	4.75	Little Six	3.25	4.25	Republic	4.25	5.00
Correja	3.50	5.00	Locomobile	4.50	5.50	Speedwell	4.13	5.25
Correja	4.00	6.00	Lozier	3.63	5.50	Speedwell Rotary	4.13	5.25
Crane	4.38	6.25	Luverne	4.25	5.25	Staver	4.00	6.00
Crow-Elkhart	4.13	5.25	McFarlan	4.00	6.00	Stearns-Knight	4.25	5.75
Crow-Elkhart	3.75	5.50	McIntyre	3.50	4.50	Stevens-Duryea	4.32	5.50
Croxton	4.25	5.50	Marmon	4.50	6.00	Studebaker	3.50	5.00
Duquesne	3.75	5.50	Midland	4.00	5.00	Stutz	4.25	5.00
Firestone-Columbus	4.13	5.25	Mitchell	4.25	7.00	Touraine	4.00	5.25
Flanders	3.63	4.50	Mitchell	3.75	6.00	Warren	4.00	5.00
Flanders	4.00	4.75	Moon	4.00	5.75	Westcott	4.00	6.00
Garford	3.75	6.00	Moyer	4.00	5.00	Zimmerman	3.75	5.00
Havers	4.00	5.00	Norwalk	4.00	5.00			
Herreshoff	3.38	4.50	Norwalk	4.50	5.50			

1913 SIX-CYLINDER MOTORS

A. E. C.	3.75	5.50	Garford	3.75	6.00	Nyberg	3.75	6.00
A. E. C.	4.25	5.00	Great Eagle	4.13	5.25	Nyberg	4.25	5.25
Alco	4.75	5.50	Havers	3.75	5.00	Oakland	4.13	4.75
Alpena	3.75	5.25	Havers	4.00	5.00	Oldsmobile	4.13	4.75
Amplex	4.13	5.25	Herreshoff	3.38	4.50	Packard	4.00	4.50
Auburn	3.75	5.25	Holly	4.00	5.00	Packard	4.50	5.50
Auburn	4.13	5.25	Hudson	4.13	5.50	Palmer-Singer	4.00	5.00
Austin	4.00	5.00	Interstate	4.00	5.00	Palmer-Singer	4.88	5.50
Austin	4.50	7.00	Jackson	4.13	4.75	Peerless	4.00	5.50
Austin	4.50	7.00	Keeton	3.75	5.50	Peerless	4.50	6.00
Burg	3.75	5.25	Kisselkar	4.50	5.25	Peerless	5.00	7.00
Burg	4.13	5.25	Klinekar	4.10	5.00	Pierce-Arrow	4.00	5.50
Cameron	3.88	3.75	Klinekar	4.25	5.50	Pierce-Arrow	4.50	5.50
Carroll	4.13	5.25	Knox	4.38	5.50	Pierce-Arrow	5.00	7.00
Chadwick	5.00	6.00	Knox	5.00	5.50	Pilot	4.00	6.00
Chalmers	4.25	5.25	Lenox	4.00	5.00	Pope-Hartford	4.32	5.38
Chevrolet	3.55	5.00	Lexington	4.13	5.25	Premier	4.00	5.00
Cino	4.00	6.00	Little Six	3.25	4.25	Premier	4.50	5.25
Coey	4.00	5.00	Locomobile	4.25	5.00	Pullman	4.50	5.50
Colby	4.13	5.25	Locomobile	4.50	5.50	Rayfield	3.50	5.50
Cole	4.13	4.75	Lozier	3.63	5.50	Republic	4.25	5.00
Correja	4.25	5.00	Lozier	4.63	5.50	Speedwell	4.13	5.25
Correja	3.50	5.00	Luverne	4.25	5.25	Speedwell Rotary	4.13	5.25
Correja	4.00	6.00	Marmon	4.50	6.00	Staver	4.00	6.00
Crane	4.38	6.25	Matheson	4.50	5.00	Stearns-Knight	4.25	5.75
Crow-Elkhart	4.13	5.25	McFarlan	4.00	5.00	Stevens-Duryea	4.32	5.50
Crow-Elkhart	3.75	5.00	McFarlan	4.00	6.00	Stoddard-Dayton	4.50	5.50
Croxton	4.25	5.50	McFarlan	4.25	5.00	Studebaker	3.50	5.00
Duquesne	3.75	5.50	McIntyre	3.50	4.50	Stutz	4.25	5.00
Fiat	4.40	6.00	Midland	4.00	5.00	Touraine	4.00	5.25
Firestone-Columbus	4.13	5.25	Mitchell	4.25	7.00	Warren	4.00	5.00
Flanders	3.63	4.50	Mitchell	3.75	6.00	Westcott	4.00	6.00
Flanders	4.00	4.75	Moon	4.00	5.75	White	4.25	5.75
Franklin	3.63	4.00	Moyer	4.00	5.00	Winton	4.50	5.00
Franklin	4.00	4.00	Norwalk	4.00	5.00	Zimmerman	3.75	5.00
Garford	4.25	5.25	Norwalk	4.50	5.50			

The CARS of 1913 Illustrated

CARS for 1913 are illustrative of a number of tendencies which have been growing for several years and have become sufficiently crystallized in this year's products to make them very noticeable. The first thing that strikes the casual observer of the cars as a whole is the increased beauty of line combined with utility of design which is exhibited. Long flowing lines, easy curves, and smooth, clean-cut appearance are the rule this year instead of the exception among the open bodies, while in the closed cars two opposing tendencies which have been gaining for years have resulted in two distinct types of design, diametrically opposite in intent. One of these is the colonial style, which this year has been carried to a point almost of exaggeration, while the other is the stream-line effect, with its sweeping curves and subdued corners.

¶ Electric lighting and electric starting are the feature of the year in all classes of cars. Except in the very cheapest, electricity is relied upon to furnish not only the power for lighting the car but at the same time is utilized to take the place of the laborious hand cranking. This is only the latest evidence of the effort toward ease of operation and riding which is the aim of the engineers. The effort has resulted also in longer and more flexible springs, longer wheelbase and deeper upholstering. There is a tendency toward a mean price of $2,500; those above this figure reducing and those below raising.

Two Passenger Cars - $3000 and over -

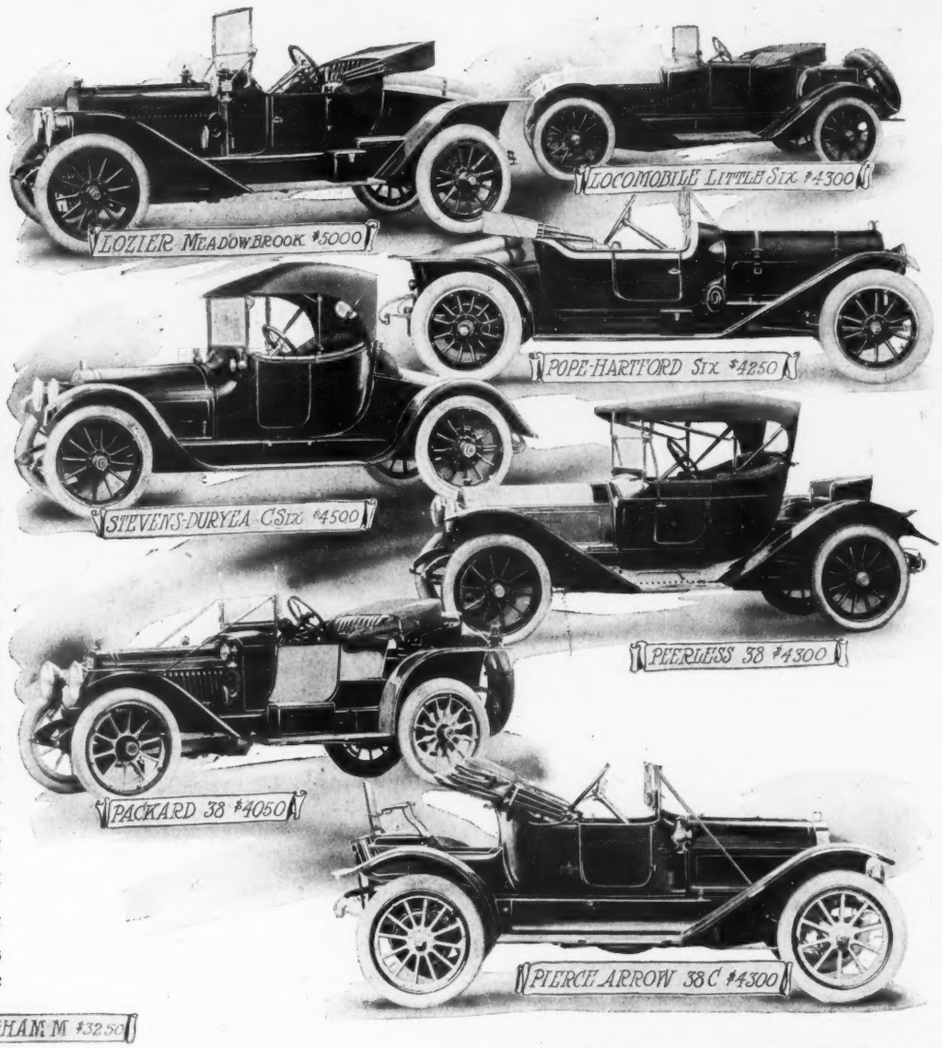
TWO-PASSENGER cars of the open type, which means all except the coupes and includes the vehicles variously known as runabouts, roadsters, speedsters, semi-racers, etc., are not quite so much in evidence this year as in 1912. There are two reasons apparent for this drop in the two-passenger field, both of which seem to speak well for the increasing stability of the industry. In the first place, firms which still are marketing cars of the roadster type for the new season have in general cut down the number of chassis models listed. This means that the 1912 line has been sold out and there is no need of carrying over the 1912 surplus as models different from the strictly 1913 line.

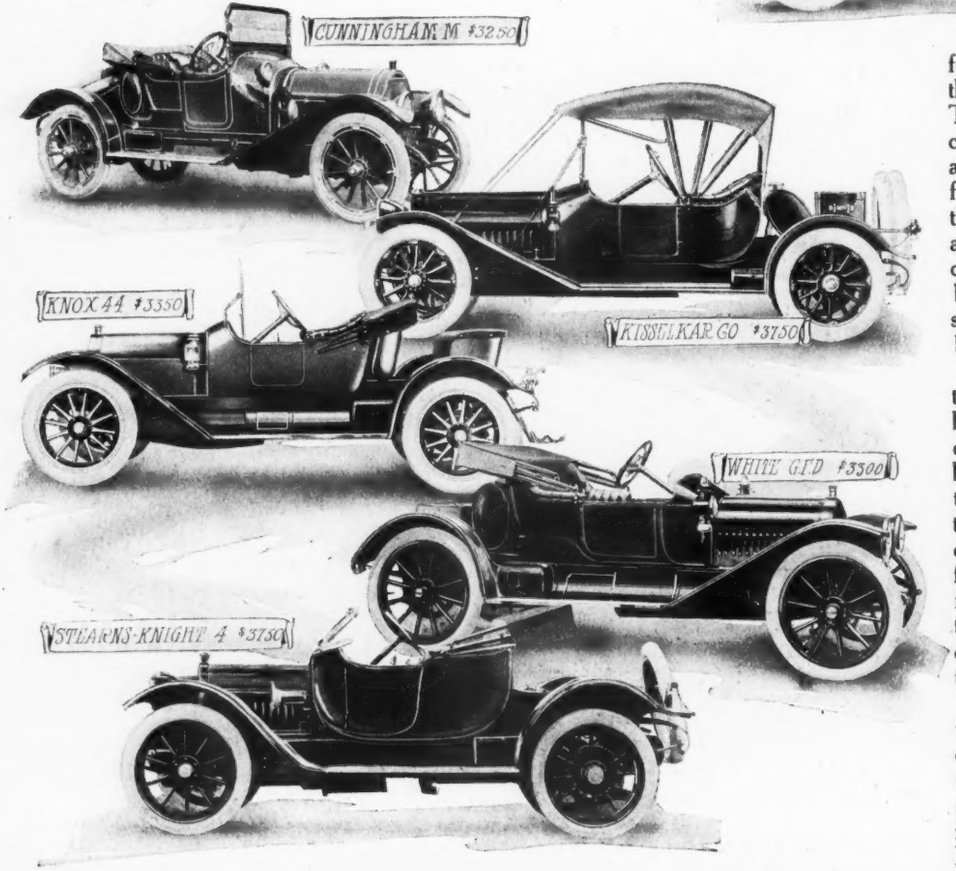
Another reason for the drop in the number of two-passenger cars on the market is the fact most of the makers which have fallen by the wayside, the firms which have been forced out of the market by financial difficulties during the year just past, were selling the low-priced cars, the class in which the two-passenger vehicles abound in the greatest proportion. The weeding out of these weak sisters cannot help but strengthen the industry as a whole.

There are only thirty-three cars of the two-passenger class offered at less than $1,250 for the new season, while for the buyer in the same class last year the market provided sixty-three cars. That is, the buyer in what may be called the $1,000 class has only half as many two-passenger cars to choose from as he had in 1912. Likewise, there are only slightly more than half as many makers offering this type of car under $1,250 as there were in 1912, the exact number being twenty-six in 1913, as against forty-eight in 1912. This is a drop of 46 per cent.

Among the roadsters selling between $1,250 and $2,000, there has been a gain of one in the number of cars. Those offered for 1912 numbered seventy-three, with one more for the new year. In spite of this fact, the number of two-passenger cars in this class shows a drop from sixty-two to fifty-nine. This can be explained by the fact that many of the makers of this type of car have increased the number of models carrying two-passenger bodies this year.

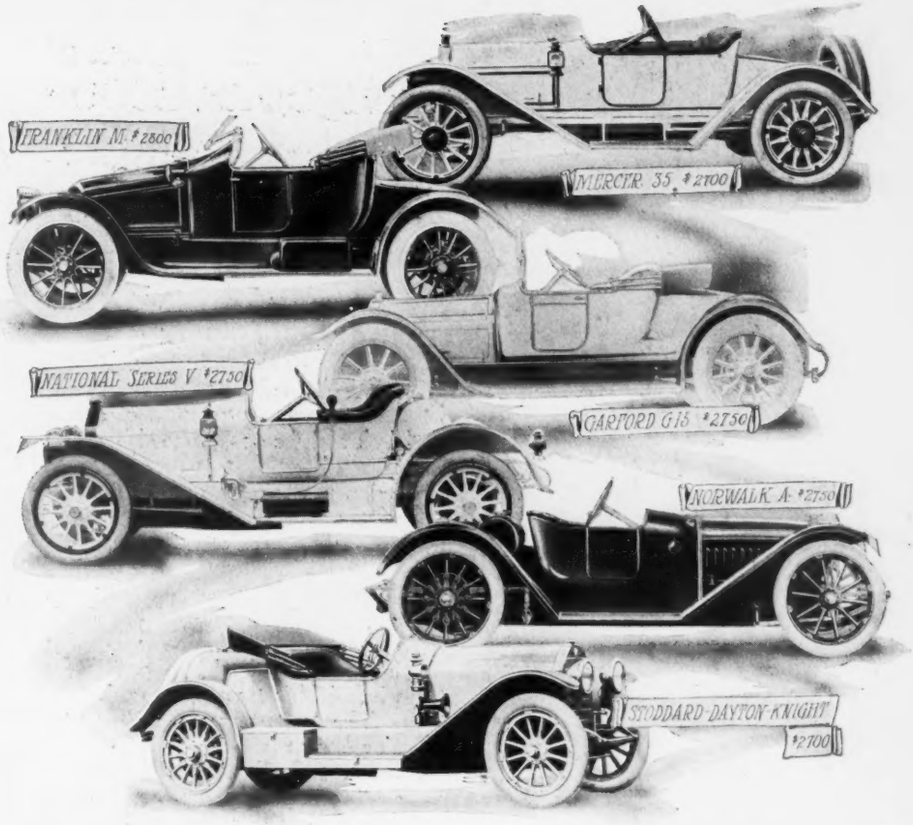
Inside control has become almost universal and left-hand drive has increased in popularity, but not so much as has the center location of gear shift and emergency brake levers, although in some instances, left-hand drive and left-hand control are employed.

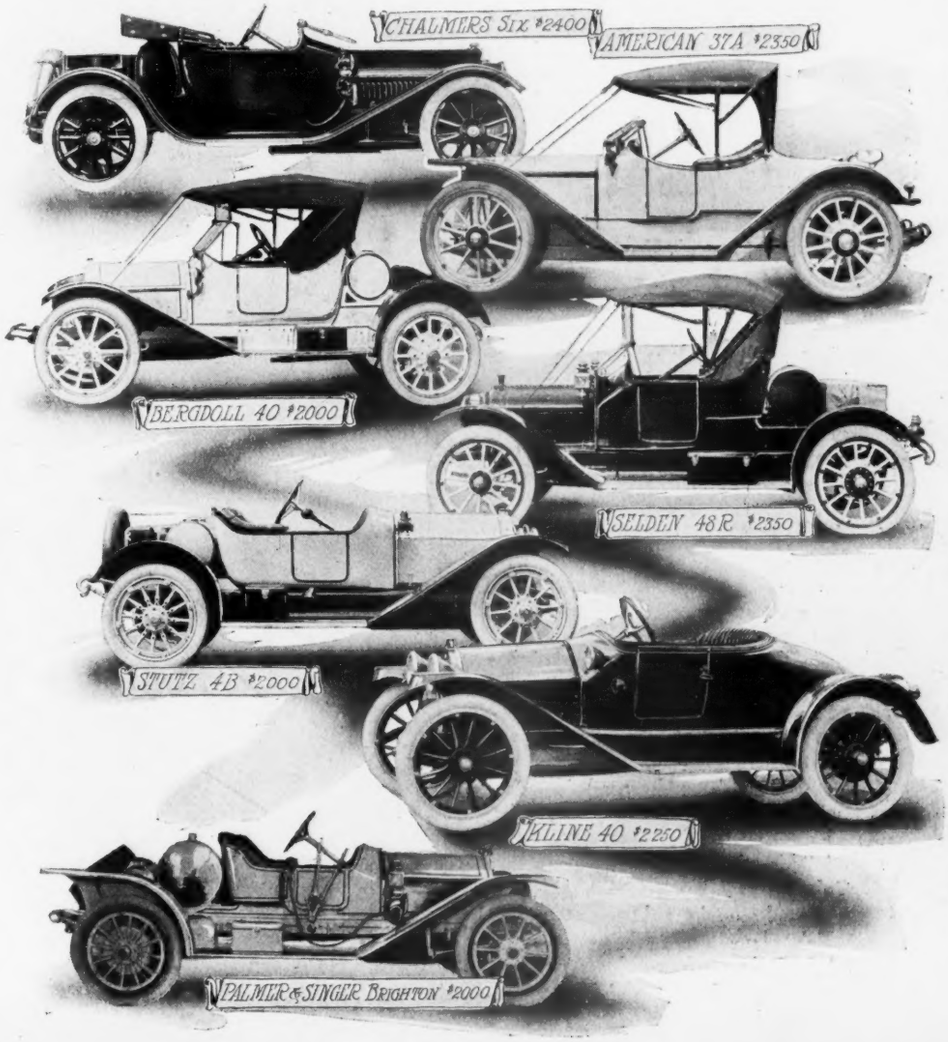




Runabouts and Roadsters from $2000 to $3000

WITH a very few exceptions, the same general tendencies that are noted throughout the entire line of 1913 cars are apparent in the two-passenger divisions as well. Such universal trends as the adoption of electric lighting, engine starters, inside control, left-hand steer and central location of gear shift and emergency levers are in evidence among the roadsters and runabouts as among the cars of greater capacity. The tendencies towards greater depth of cowl, more of the stream-line effect in the bodies and disposition of the spare tires at the rear are more true of this division of the field than of any of the other divisions. This is to be expected, for cars of this type are intended to have or give the appearance of speed; consequently, the stream-line body lines are employed not only to cut down the wind resistance but even more to give the appearance of a speedy car. The deepening of the cowl goes hand in hand with the changing of body lines, as it is a part of the same general scheme. However, it also has the additional function of protecting the instruments and appurtenances on the dash. In several instances the deep cowl has been utilized to provide a carrying space for the gasoline. This European idea is taken advantage of by the Henderson, Hupmobile, Paige, Moline and Case cars. In some others the space in the cowl is utilized for carrying a small reserve tank of fuel.





Arrangements for carrying the tires at the rear are simplified in the two-pasenger field. A growing tendency is found towards utilizing the rear deck, which in most instances has been made more sloping, as a place for carrying two or more spare tires, either horizontally or nearly so. Very often, where a round gasoline and oil tank is employed, the tires are disposed about it so that the tank affords an additional protection against losing the tires.

In runabouts, roadsters, etc., listing at a price about $2,000, there is a falling off in both the number of cars offered and the number of firms making them, as compared with last year. There were ninety-six cars of this description on the market in 1912, which number has fallen to eighty-seven for 1913. These were produced in 1912 by seventy-three makers, with only sixty-nine listing them this year. Taking the cars in this field as a whole, without reference to price, there is seen a drop in the number of models since last year from 232 to 193, while there are nine fewer makers in the ranks than the 162 recorded in 1912.

Runabouts Listed at $1500 to $2000

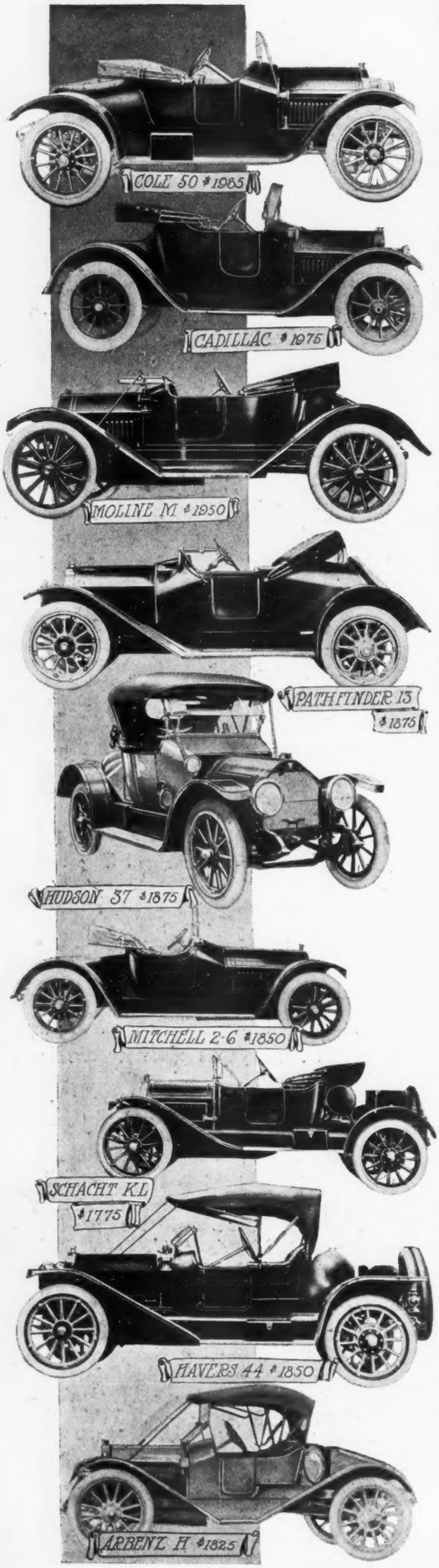
BAGGAGE-CARRYING facilities show a great diversity in this field. In most instances, the old method of a touring trunk at the rear is utilized, but the compartment arrangement which characterized the Stoddard-Dayton for last year has been extended to another of the United Motor products, the Maxwell roadster.

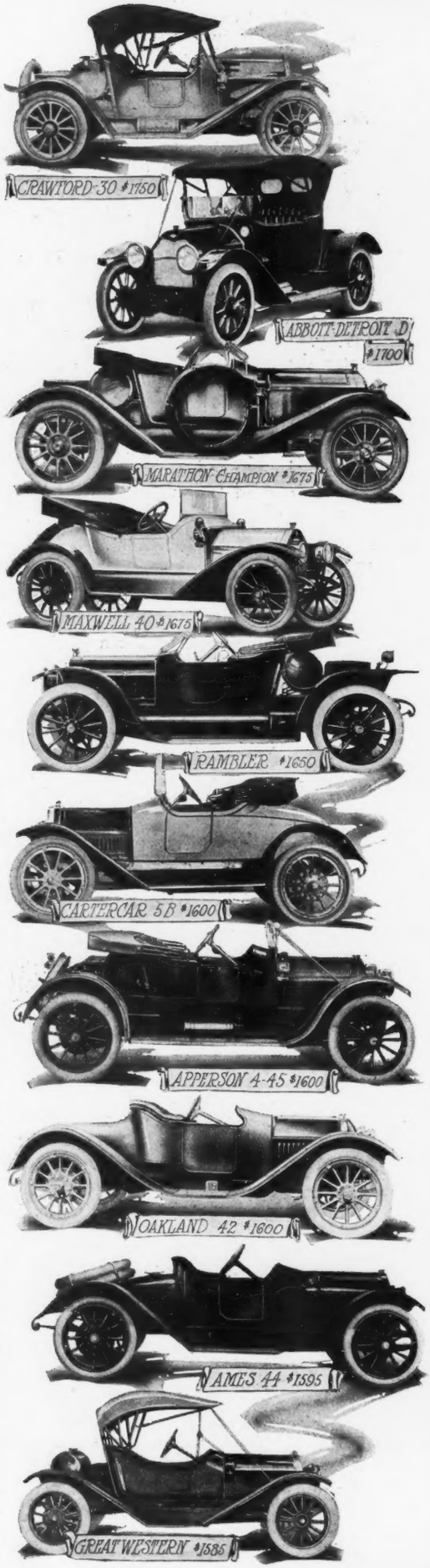
In many instances the square dash and the straight cowl has been changed to give it an upward curve, which not only increases the beauty of the lines of the car as viewed from the side but also tends to throw the wind upward and away from the occupants of the front seat. It also has an additional advantage of offering a ventilating feature when the lower part of the windshield is thrown forward.

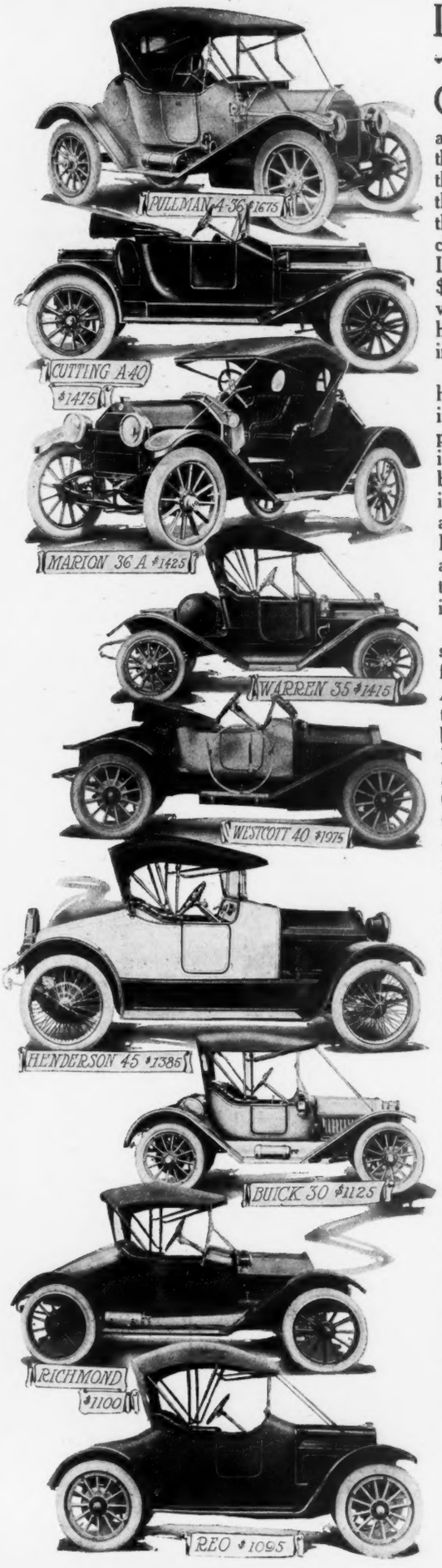
The greatest move for clean running boards is the indirect result of the general adoption of the electric starting and lighting system. Such systems require so much more battery capacity than is necessary for ignition and signaling devices that the running board cannot well accommodate the battery. Further, this makes the battery installation a carmaker's proposition, so that it generally is suspended on the frame under the body. These systems also incidentally do away with gas storage tanks.

There has been very little change in the location of the motor and radiator during the past season. The tendency towards carrying the power plant a little farther back and thus bringing the radiator on a line with or little in front of the front axle seems not to have been developed any further than it was in 1912. This is probably due to the fact that to accomplish this more or less desirable result it is necesary either to lengthen the wheelbase or to sacrifice leg or storage room, and makers seem to be satisfied with the present arrangement.

In the matter of list price of the two-passenger cars there has been a gradual interchange among the makers as to price classification. Two makes of roadsters, the King and Lion, have been lowered in price sufficiently to drop them from the $1,500 classification into the $1,000 class. Four others, the Cole, Halladay, Overland and Velie, have brought out models which place them this year in the $1,500 class, whereas last year they were listed in the $2,500 price classification.







Low Priced Roadsters and Runabouts

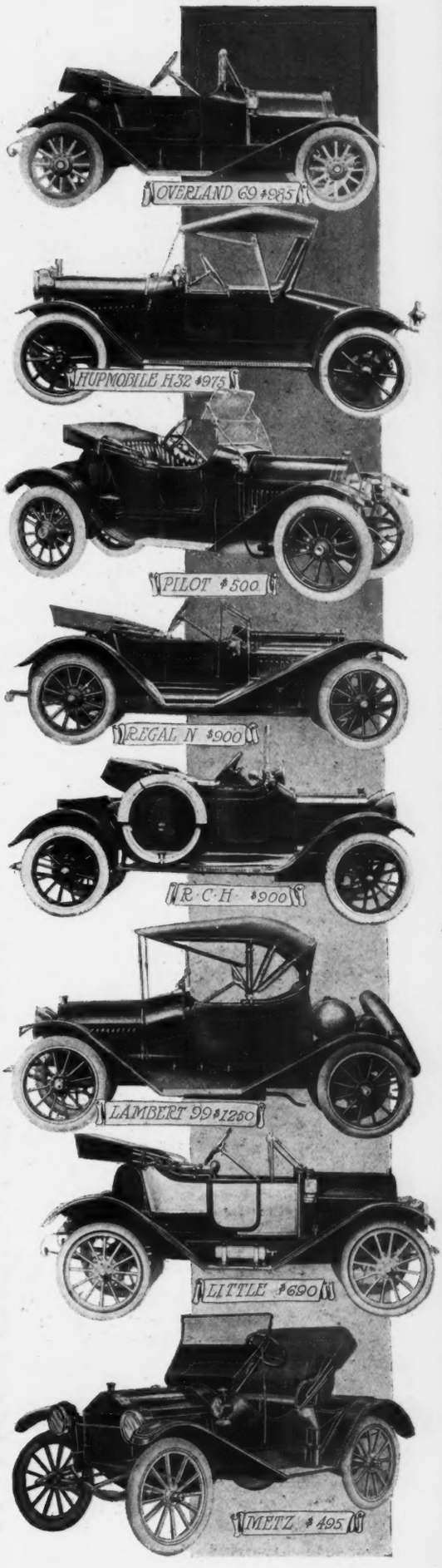
OTHERS have increased the price of their roadsters so that they are occupying higher positions in the arbitrary price classification than they did last year. Among these is the Cutting, which has jumped from the $1,000 class to the $1,500 class. The Coey, Haynes and Lenox have moved upward from the $1,500 class to the next higher division and the National and Spoerer have jumped from the $2,500 field into that of the $4,000 field.

This gradual increase in price has not been made without a general increase in car values. It is accompanied in nearly every instance by an increase in wheelbase of tire sizes, or both, or even in some instances in increased motor size. The general adoption of the electric starting and lighting system can, however, be accredited more than any other one thing with the advance in list price in the two-passenger ranks.

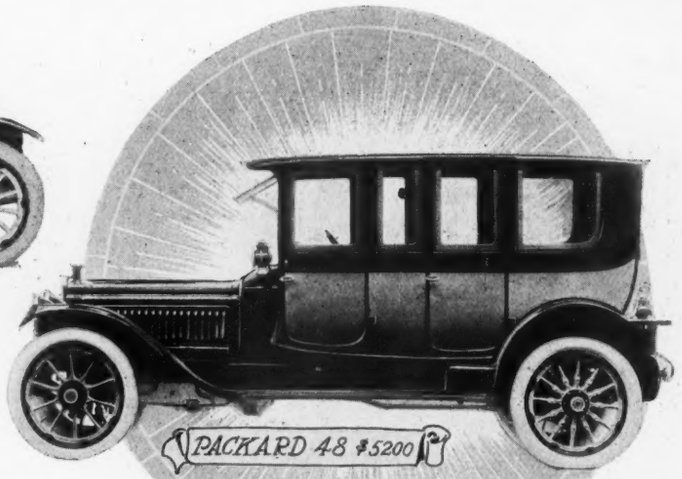
There are a number of new roadsters listed which appear for the first time on the motoring boards. Among them are the Detroiter, Little Four, Perfex and the Studebakers, which replace the old E-M-F and Flanders cars. There are also the Burg, the Henderson, Omaha, A. E. C., Duquesne, Keeton and Croxton, a dismemberment of the old Croxton-Keeton, Touraine, Carroll and Edwards.

At the same time, there are many old-timers in the ranks of two-passenger cars which have not reported at roll-call this year. These include the Anna, Brush, Courier, Dalton, DeTamble, Elmore, Johnson, Jonz, Kenmore, Penn, Picard, Ritter, Roader, Rogers and Union. All of these listed two-passenger cars in 1912, sold under $1,250, which in a great measure accounts for the falling off in the number offered the buyer of roadsters in the $1,000 class.

Some of those which are missed from the higher classifications are the Everitt, Henry, New Parry, Otto, Reading, Shelby, Corbin, Four-Wheel Drive, Marquette, Suburban and Thomas. The mere fact that these cars are listed among those not present does not mean necessarily that these care are not being manufactured, but that in some instances the plans of their makers for 1913 are not decided upon definitely enough to allow their line for this year to be recorded at this time. In most cases, however, the names that have been lost from the ranks represent actual retirements.



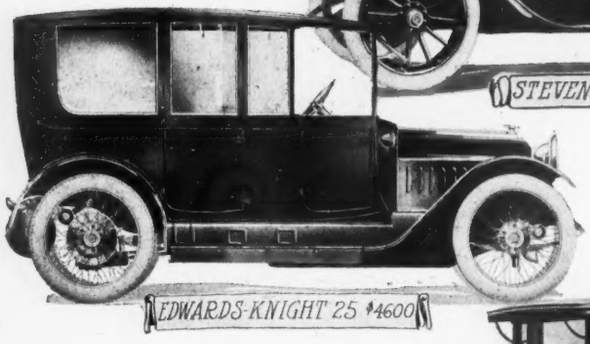

SIMPLEX 38 $6500


PACKARD 48 $5200


LOCOMOBILE R $5350


STEARNS-KNIGHT 4 $5000


STEVENS-DURYEA C $5500

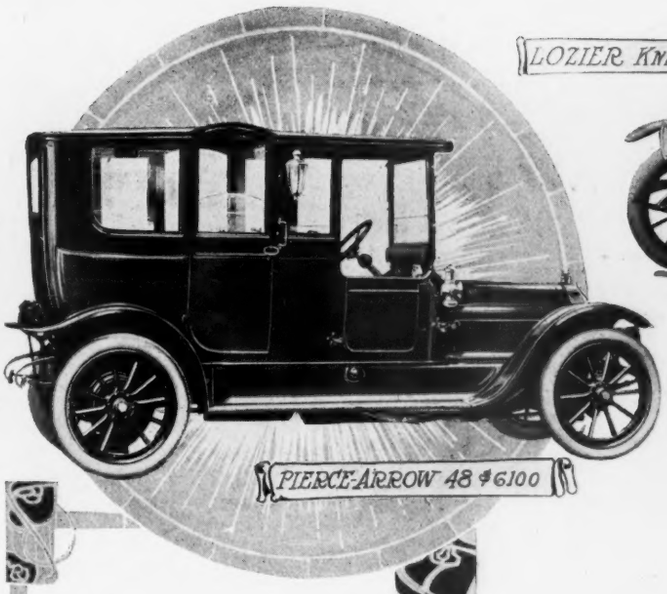

EDWARDS-KNIGHT 25 $4600


WHITE SIX G.F. $6300

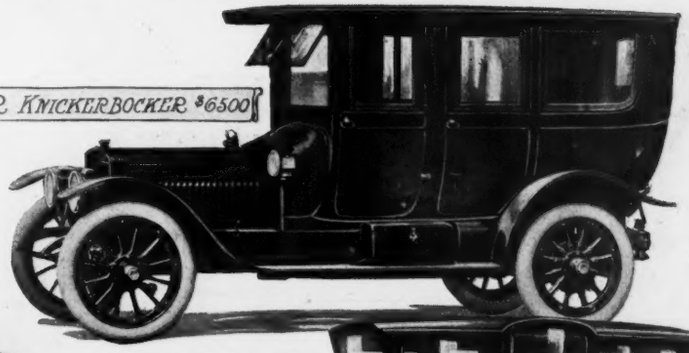
Enclosed Cars of Larger Capacity

IT is in the field of the enclosed cars, such as limousines, landaulets, broughams, town cars, sedans, etc., that the greatest advancement of the year in the art of car building has been attained. In this class not only has the refinement of mechanical details of power plant and running gear, which marks the whole field of motor cars, affected the chassis of the enclosed cars, but also in its highest degree is shown the advancement in the body builder's art. The tendencies in body construction of the enclosed types of cars for the new year are strongly marked and quite general throughout the ranks of car makers.

As is to be expected, by far the greater number of cars of this type is to be found among those selling at a price greater than $4,000. This type of car is the most expensive of any on the American market. The number of cars in this class shows a drop of a possible 20 per cent over last year's figures, while the number of makers shows a drop of 40 per cent. The 159 models offered in 1912 were the product of 58 makers, while only 124 models are offered this year from 37 factories. New names among these cars and in this class are the Edwards, which appears on the market for the first time, Hudson, Kline, McFarlan, Midland, Morse and National.



PIERCE-ARROW 48 $6100



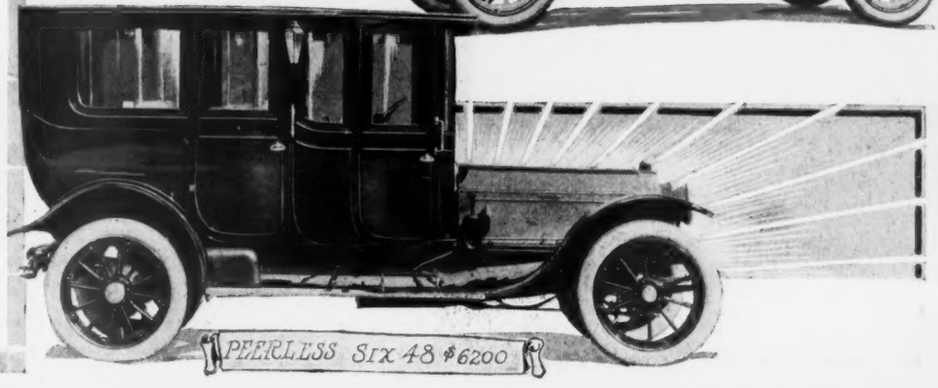
LOZIER KNICKERBOCKER $6500

STEVENS-DURYEA C SIX $5750

SIMPLEX 38 $6500

PACKARD 38 IMPERIAL $5400

COLUMBIA-KNIGHT 88 $5800

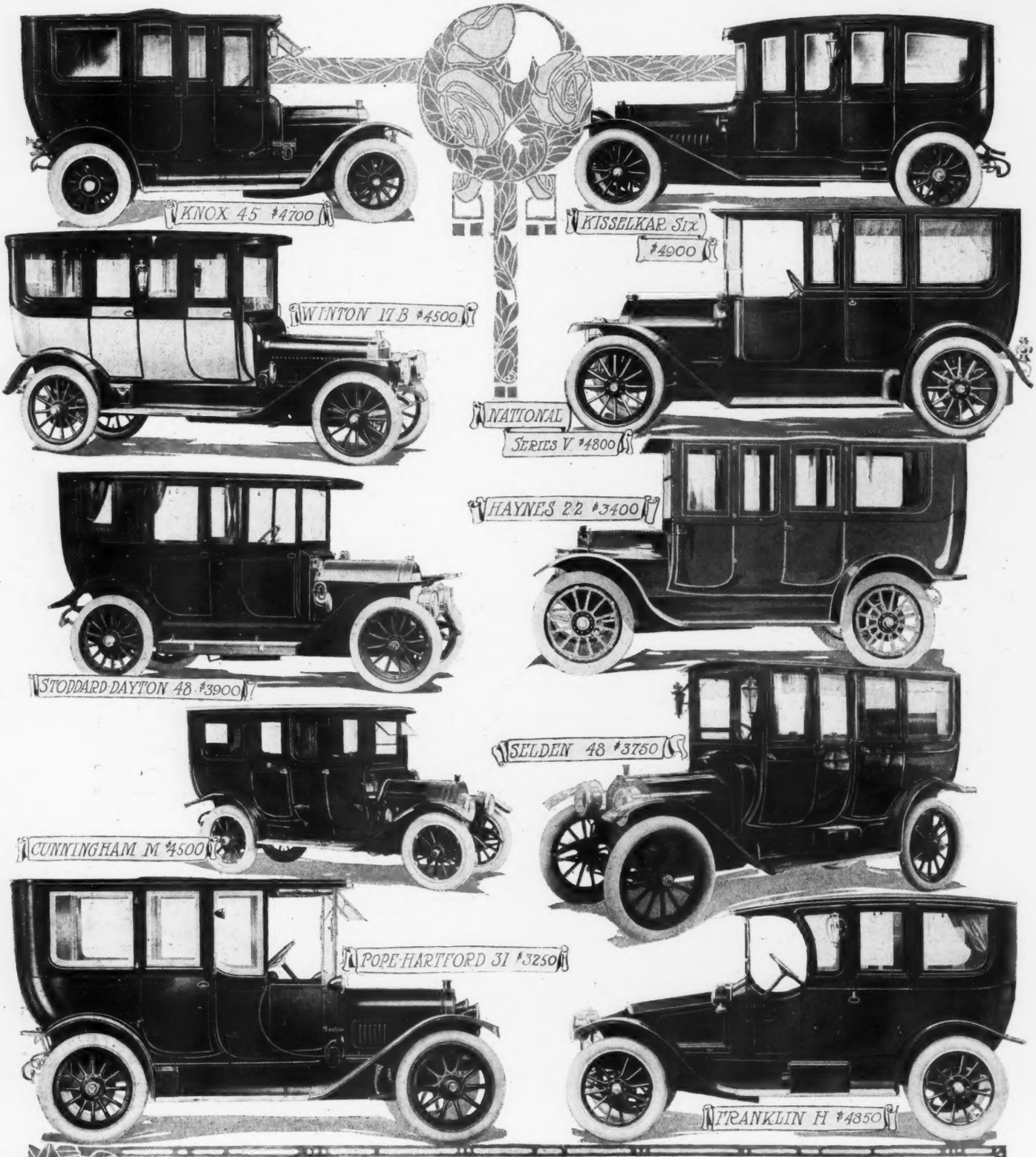


PEERLESS SIX 48 $6200

Limousines and Landaulets

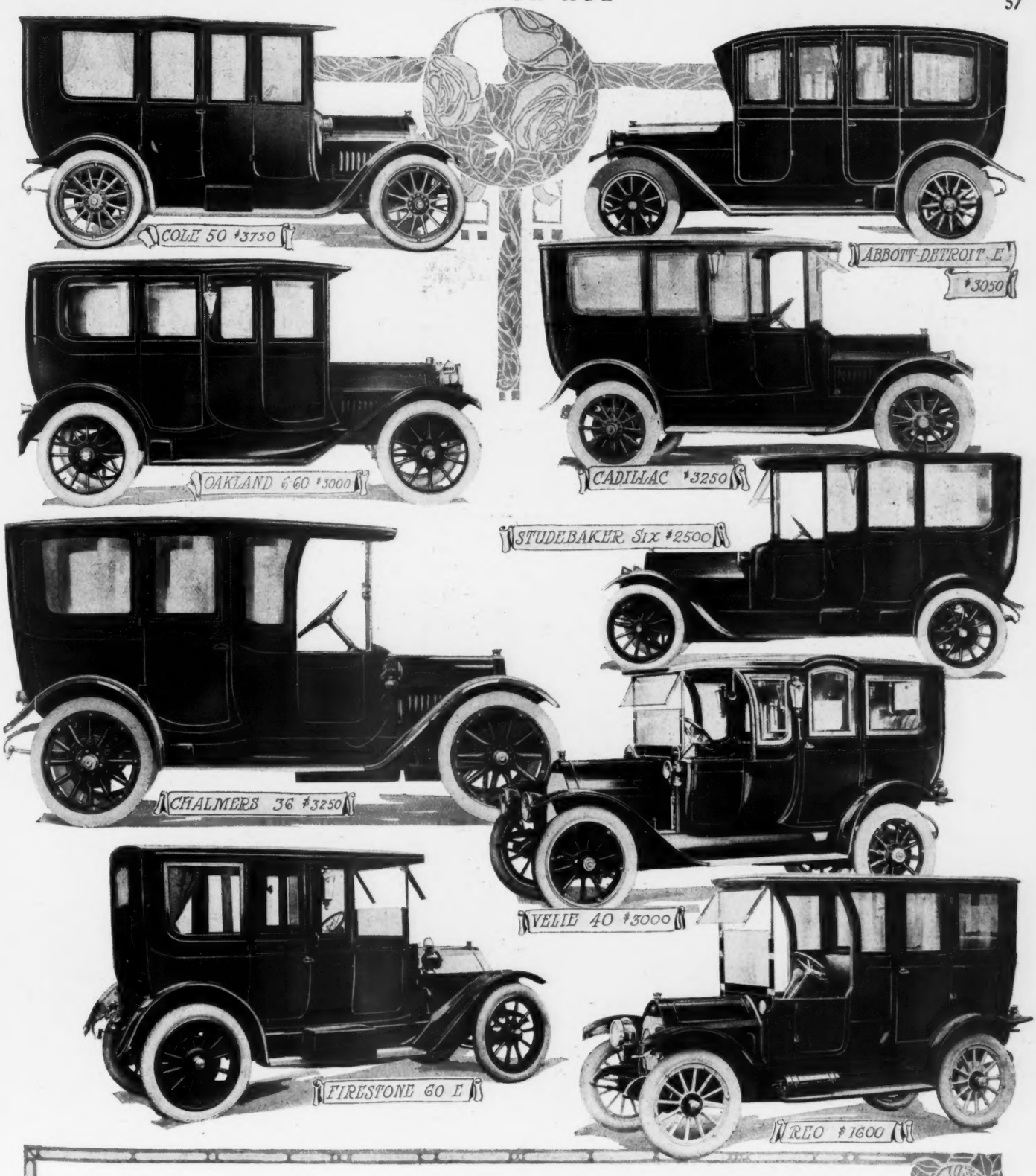
AMONG the most noticeable trends is that of the nearly universal adoption of the colonial style of body architecture, which began to be noticed early in 1912. The two or three makers of last year who were bold enough to branch out into the so-called Martha Washington and colonial styles seem to have begun a renaissance which has spread until the majority of builders have added bodies which have at least a suggestion of the colonial period.

In some cases the retrospection has gone even farther than colonial days and the types of carriage building reminiscent of Louis XIV are on view in many of the displays. The square-cut corners at the meeting of the top and sides of the body have disappeared, and designers, in order to get away from right angles, have progresed along two widely divergent paths. In the one instance they have given their body lines a decided outward flare with the sides outswept at the top so that the roof is much longer and broader than is the compartment iself. At the same time the lower lines of the body proper have been altered so that the rear line and the bottom line are connected in a sweeping curve which comes to an acute angle with the front vertical panels.



Enclosed Cars Seating Five or More Passengers

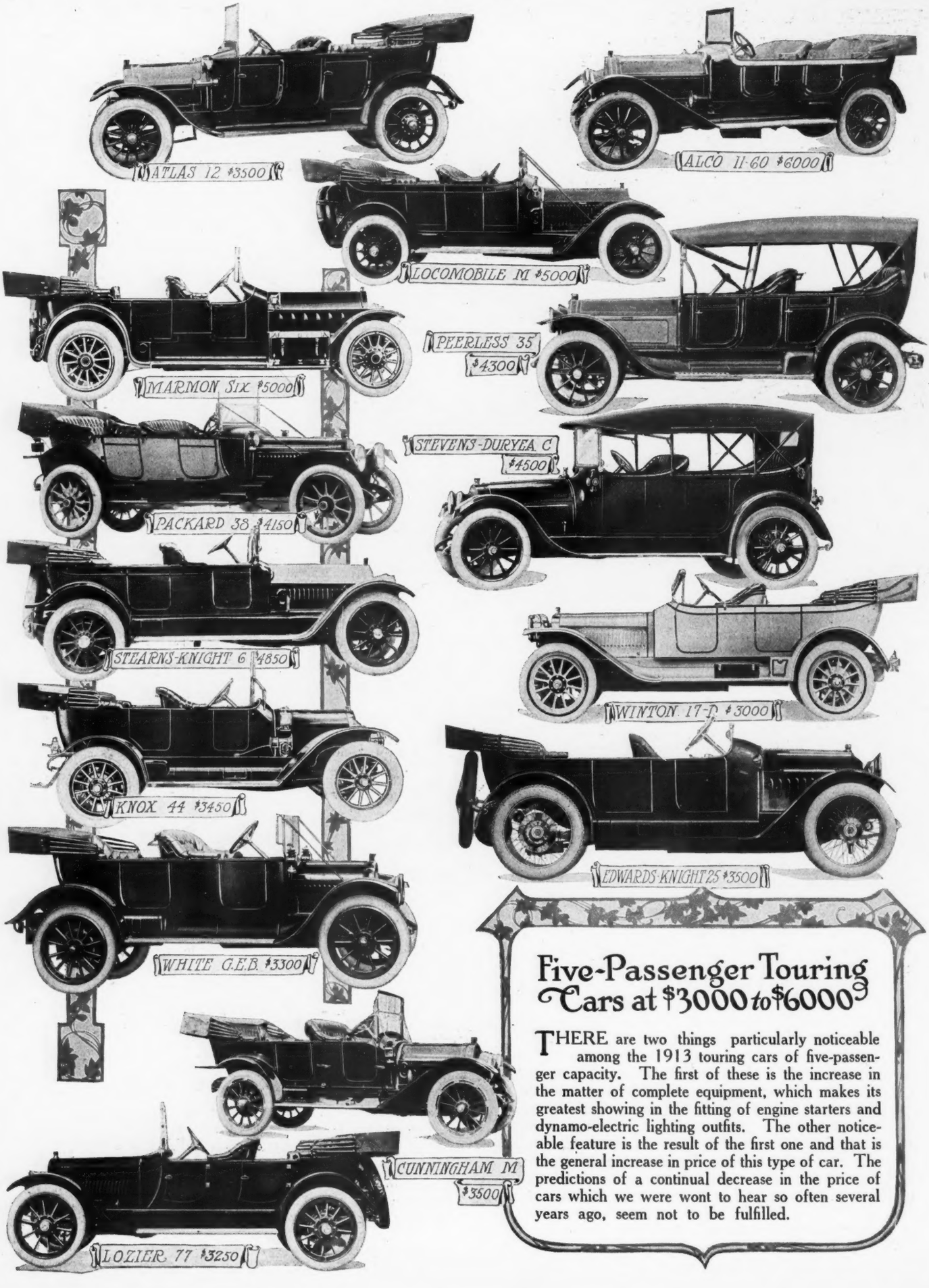
THE other design by which the four-square appearance of older bodies is avoided is almost the diametric opposite of that just described. This is an adaptation of the stream-line effect which has been popular in Europe for the past year. The sides and rear body panels are made to meet the roof in a long sweeping curve, so that the line of demarkation between the two is imperceptible. This fulfills two purposes, not only rendering a very pleasing effect but also materially increasing the efficiency of the car as a whole, particularly at high speeds, for the lines thus obtained decrease wind resistance. With the colonial style of bodies the windows are often beveled to give them an appearance of thickness.



Lower Priced Limousines, Landaulets *and* Berlins

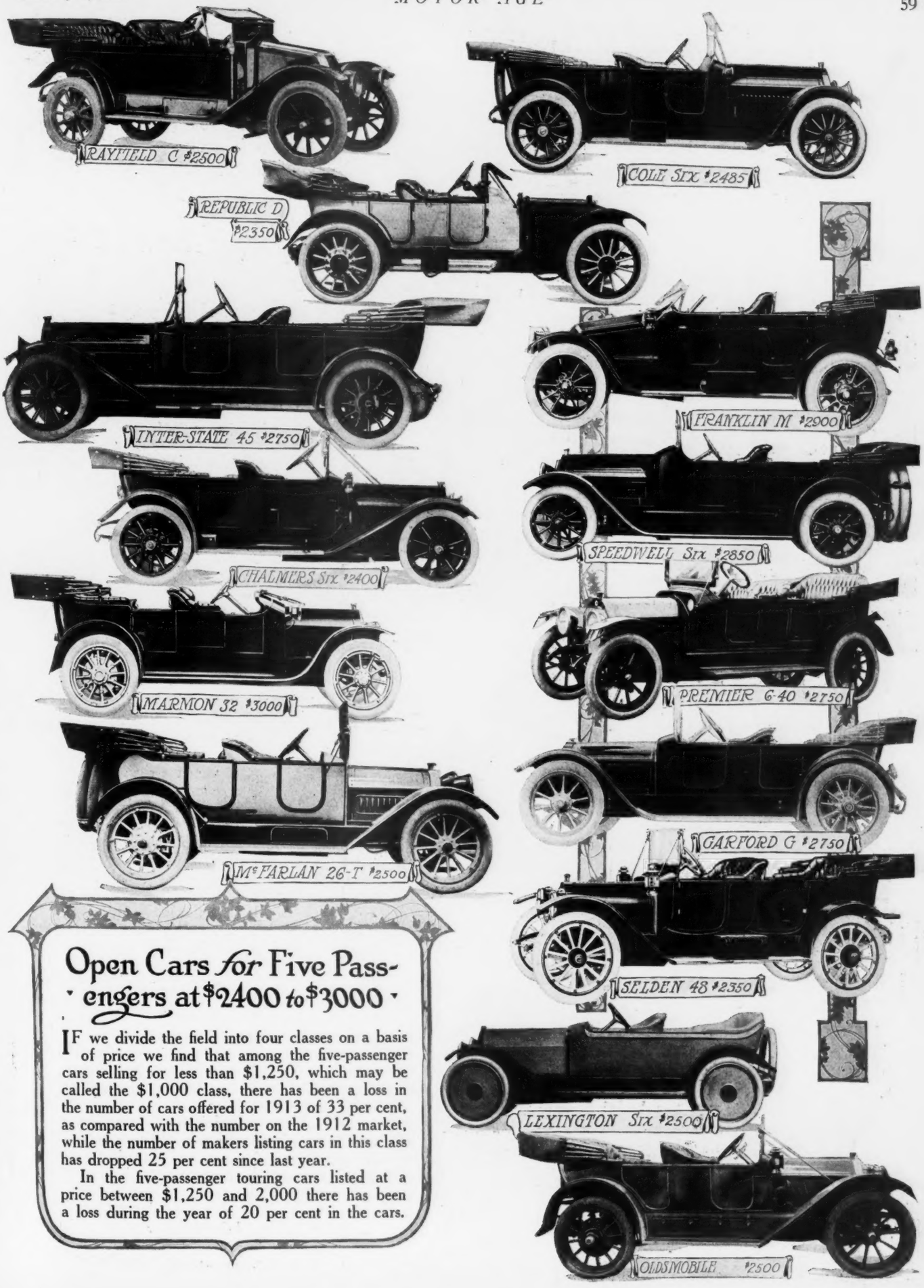
WITH the stream-line type of body, however, the windows are made as large as possible without dividing lines, and often are curved to conform to the sweeping curves of the panels. This is particularly true in regard to the front pane, which would correspond with the windshield in an open car.

The colonial type of body carries lamps of the antique pillar design of many long, narrow panes, while designers of the stream-line type of body run to the use of bullet-shaped bull's-eye side-lights and flush dash lamps. The fenders also have been altered slightly to conform with the flowing body lines, so that the front fender, instead of meeting the runningboard at an angle, are now joined to it by a sweeping curve.



Five-Passenger Touring Cars at $3000 to $6000

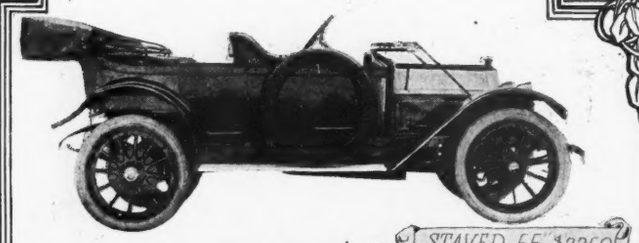
THERE are two things particularly noticeable among the 1913 touring cars of five-passenger capacity. The first of these is the increase in the matter of complete equipment, which makes its greatest showing in the fitting of engine starters and dynamo-electric lighting outfits. The other noticeable feature is the result of the first one and that is the general increase in price of this type of car. The predictions of a continual decrease in the price of cars which we were wont to hear so often several years ago, seem not to be fulfilled.



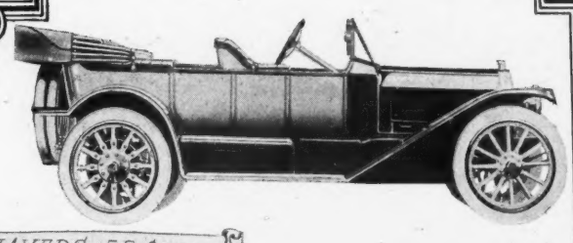
Open Cars for Five Passengers at $2400 to $3000

IF we divide the field into four classes on a basis of price we find that among the five-passenger cars selling for less than $1,250, which may be called the $1,000 class, there has been a loss in the number of cars offered for 1913 of 33 per cent, as compared with the number on the 1912 market, while the number of makers listing cars in this class has dropped 25 per cent since last year.

In the five-passenger touring cars listed at a price between $1,250 and 2,000 there has been a loss during the year of 20 per cent in the cars.

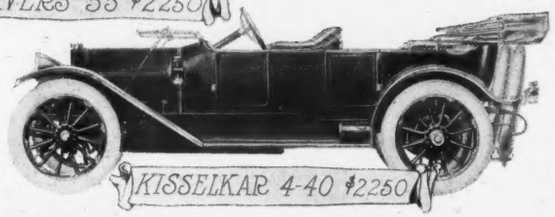


STAVER 55 $2250

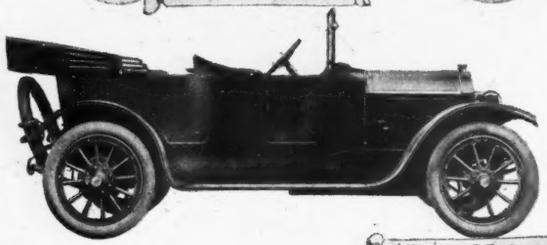


HAVERS 55 $2250

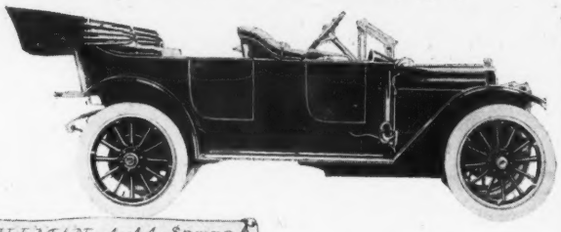
POPE 31 $2250



KISSELKAR 4-40 $2250

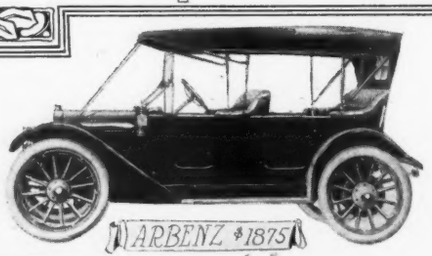


CASE N $2500

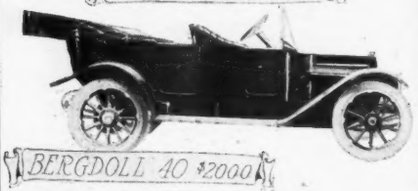


PULLMAN 4-44 $2250

HUDSON 37 $1875

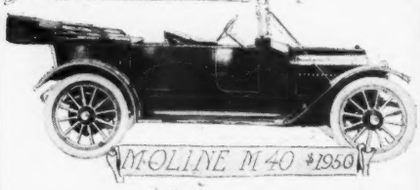


ARBENZ $1875

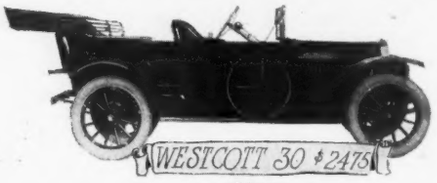


BERGDOLL 40 $2000

CRAWFORD 40 $2100

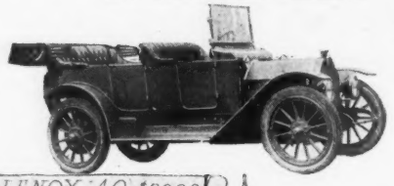


MOLINE M 40 $1950



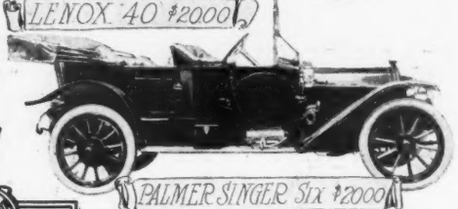
WESTCOTT 30 $2475

PATHFINDER SERIES 13 $1875



LENOX 40 $2000

NYBERG 6-60 $2000



PALMER SINGER SIX $2000

Five-Seated Touring Cars

IN the cars selling between $2,000 and $3,000 there has been a slight drop in the number of models offered, although the number of makers remains the same as in 1912. We have the same healthy indication of the market as we have in the class just mentioned, showing that the 1912 line has been, in general, sold out. In cars listed above $3,000 there is an increase in both the number of cars and number of firms represented therein. This may be taken to show that there has been a gradual rise in the price among the five-passenger touring cars; in fact if we consider the makes individually we would find that such is the case. For instance, both the Day Utility and the McIntire have increased their prices sufficiently to jump them from the $1,000 to the $1,500 class, and there is not an instance of a touring car selling around $1,500 in 1912 lowering the price sufficiently to bring it below the $1,250 mark for the coming season.

Tourists of Medium Price

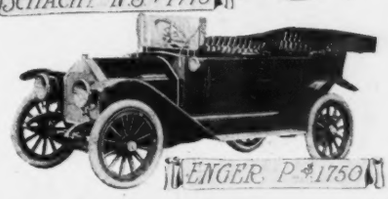
AMONG the names appearing for the first time in the roll of five-passenger touring cars are the Detroiter, Burg, Davis, Henderson, Omaha, Pacific, A. E. C., Carroll, Duquesne, Holly, Edwards, Moyer, Keeton, and Croxton. There are some that no longer appear among these cars, such as the Courier, E-M-F and Flanders, the two latter appearing under the cognomen of Studebaker, the Kenmore, Pickard, Rogers, DeTamble, Elmore, Henry, G. J. G., New Parry, Otto, Autocar, Corbin, Jenkins, Luverne, Marquette, Illinois, Ohio and Octoauto, the latter an eight-wheel car in 1912 appears for 1913 as a six-wheel car and is called the Sextoauto.

Lexington and Lenox both have increased prices sufficiently to bring them into the $2,500 class from the $1,500 class and Marmon, Midland, and National have jumped in price enough to carry them over the $3,000 mark. There are four instances, however. in which the price is lowered.


JACKSON MAJESTIC $1650


SCHACHT N.S $1775


RAMBLER $1100


ENGER P $1750


MARION 48 A $1850

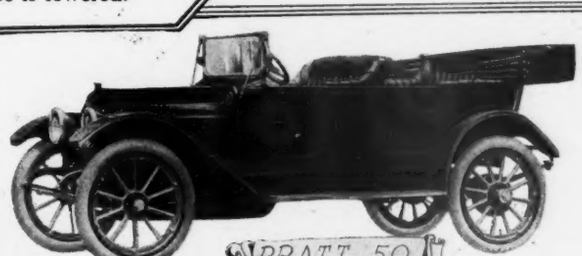

HERRESHOFF Six $1700

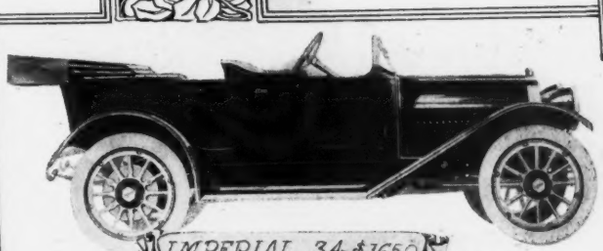

RICHMOND P $1750

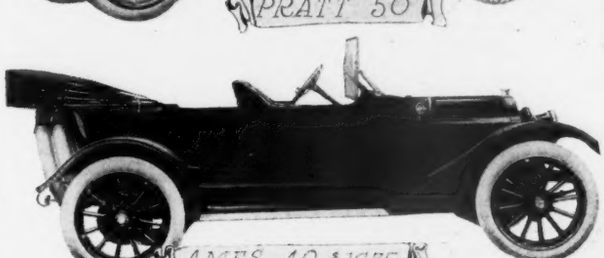

STODDARD-DAYTON 30 $1450


ABBOTT-DETROIT D $1750

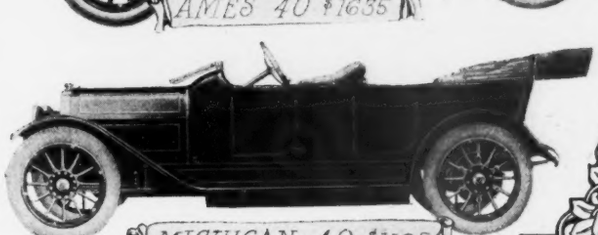

CARTERCAR 5A $1700

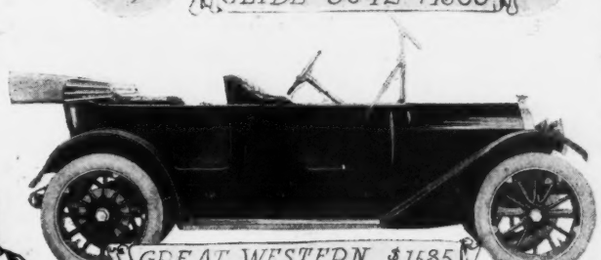

PRATT 50

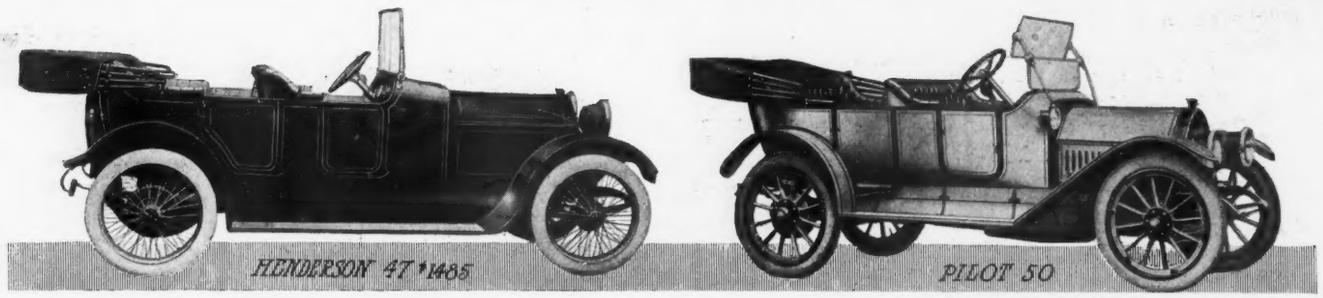

IMPERIAL 34 $1650

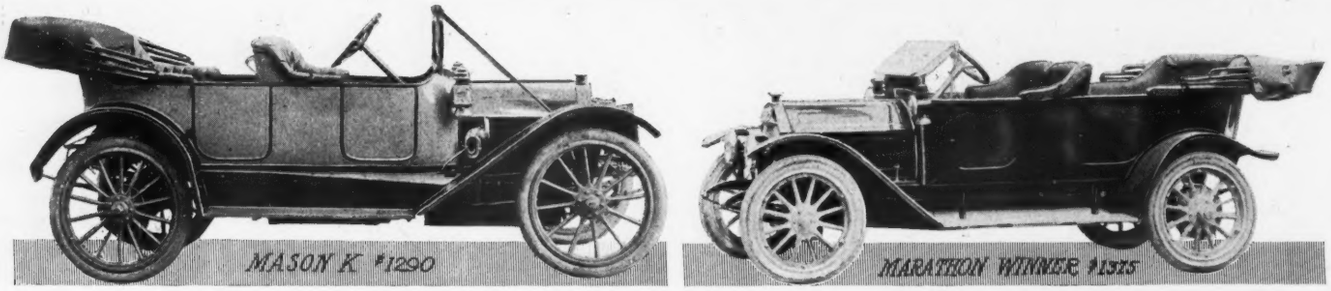

AMES 40 $1635

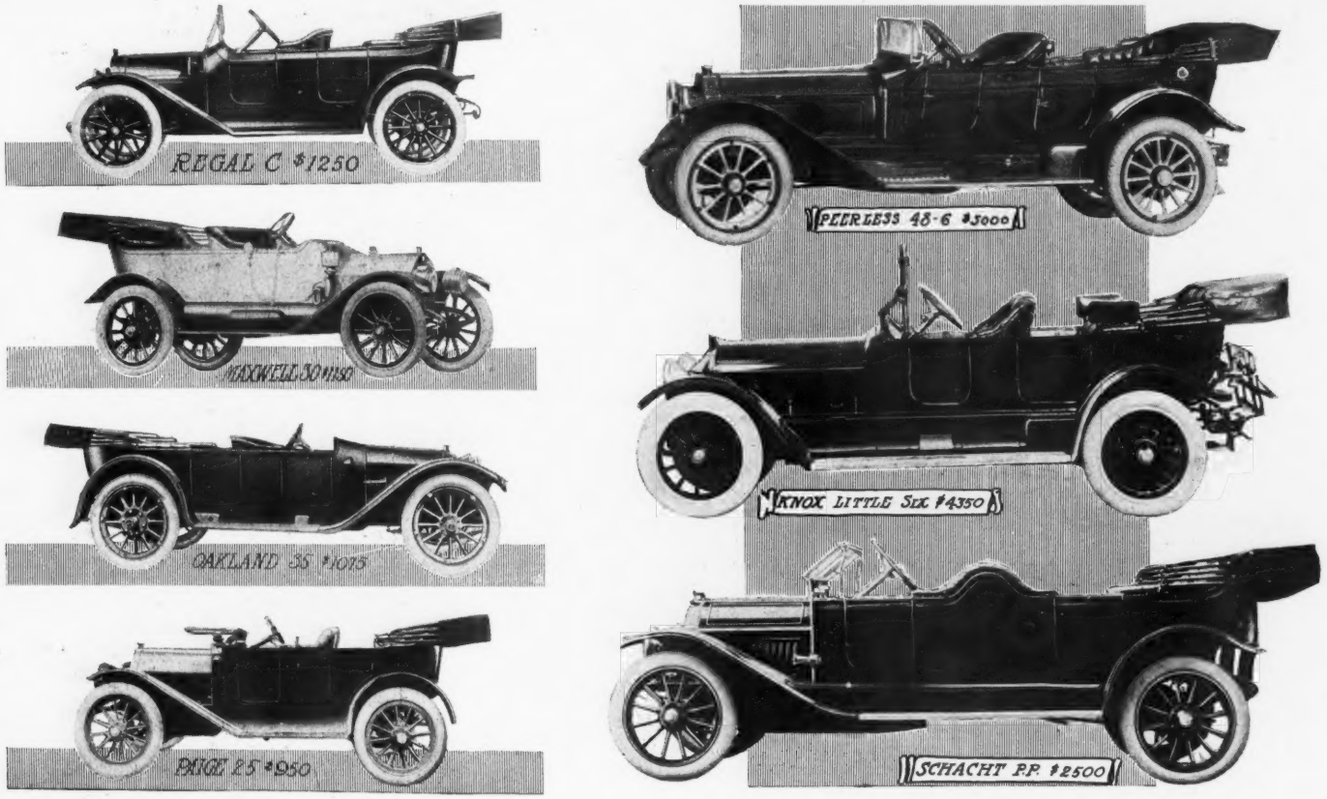

GLIDE 36-42 $1600


MICHIGAN 40 $1585


GREAT WESTERN $1585

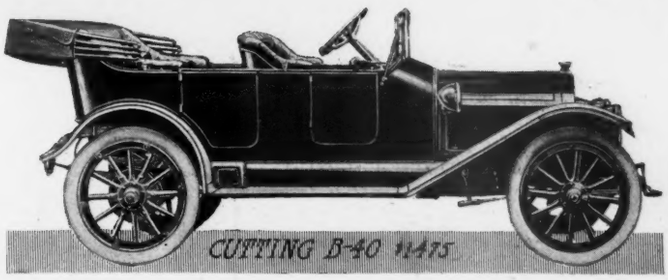


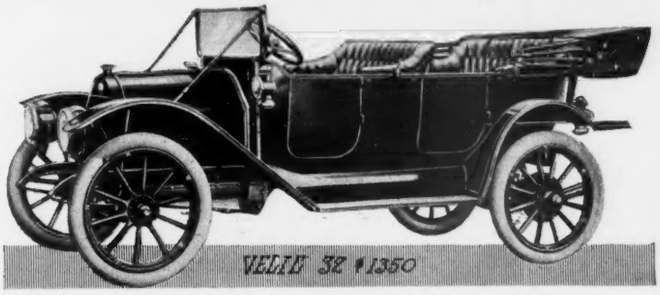


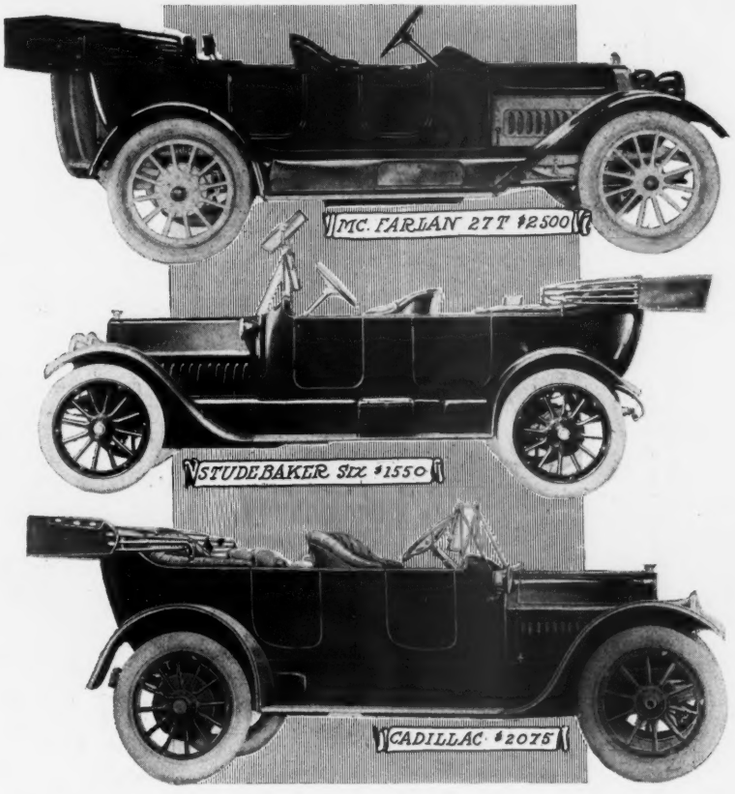


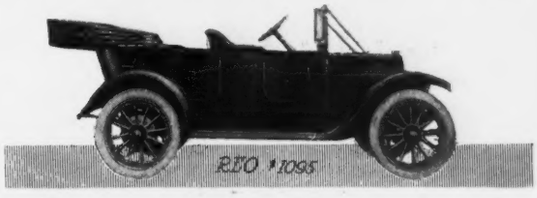
Six Seaters and Low Priced Touring Cars

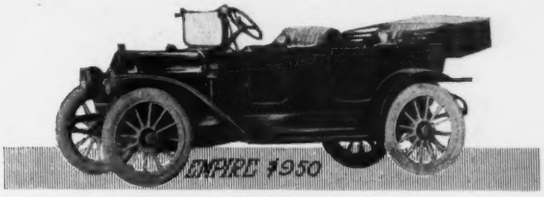
UPHOLSTERY has been improved by increasing its depth and by refinement in cushion construction. Eleven and 12 inches is not unusual for the depth of upholstery in these cars, and the increased ease in riding resulting therefrom is noticeable. Foredoors are practically universal. Along with this there has come the necessity for ventilating facilities, and these show a variety of forms. The most popular of these seem to be the type in which the flush dash lights and ventilating panel are incorporated in the same fitting. The running boards present a much cleaner appearance than they have in previous seasons. This has been accomplished by putting the tires at the rear instead of at the side, by hanging the acetylene gas storage tanks on the underside of the running board instead of having them on top of the latter and by suspending the storage battery from the frame.

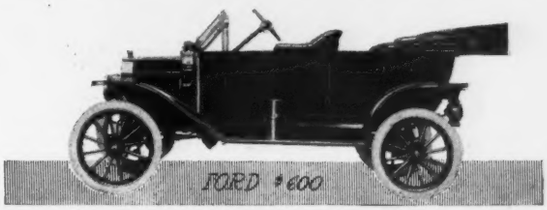












Five and Six Passenger Cars of Low Price

LIKE the 1913 cars in general, five-passenger touring cars show some universal refinements. One of these is the increasing use of a panel of different color to set off the top body lines; another is the greater smoothness of body lines and particularly the more pleasing curve at the rear of the tonneau. Perhaps the best evidence of this particular feature will be found in the Ford car, one which has been noticeable for its conservativeness in the matter of body changes. This year's Ford presents a very pleasing appearance from the rear on account of the deep inward sweep of the back of the car. The rear fenders of the 1913 touring cars are brought downward somewhat further than they have been previously, while the forward ones, in general, join to the running board with a curve instead of the sharp angle, which has been customary heretofore.

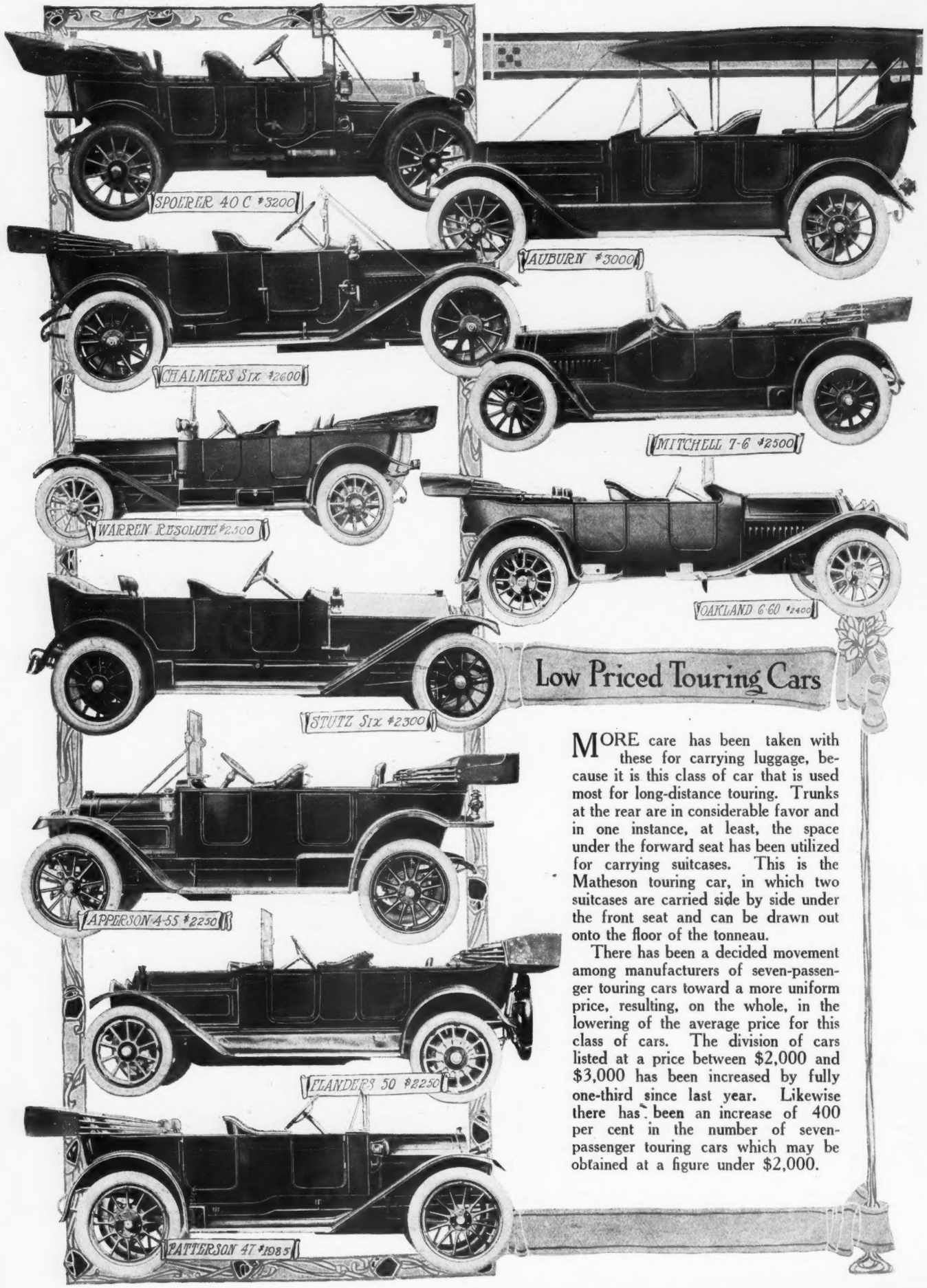
Seven-Passenger Touring Cars at $5000 to $6000

AS might be expected, there has been more advancement among the seven-passenger touring cars than among any other open style of body. Along with a rather general decrease in price which tends to bring the cars of this capacity well within the means of the average motorist there are incorporated added features which make for greater comfort and pleasure in touring. One of these is the almost universal adoption of the engine starter, electric in most cases, and always accompanied by electric lights. The two folding seats in the tonneau in many cases have been equipped with folding arms, which makes riding in them considerably easier and more comfortable. Upholstery has been increased in depth so that 11 and 12 inches depth is now the rule rather than the exception. The idea of covering the back of the front seat and the sides of the interior of the tonneau with cloth or leather has gained in favor.

Medium Priced Open Cars Carrying Seven

ALONG with longer springs and increased wheelbase to assist in giving greater ease of riding, there has been a gain in popularity of the second windshield located upon the back of the front seat and performing the double service of more fully protecting the occupants of the tonneau and also assuring them a greater degree of privacy.

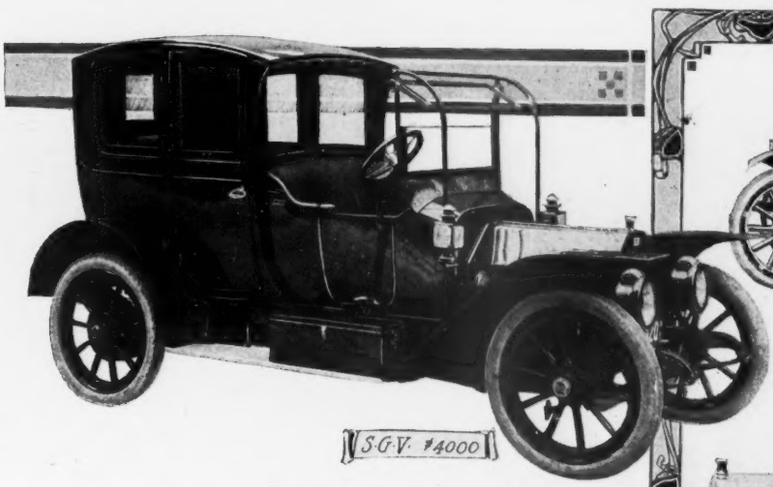
It is to be expected that the greatest proportion of cars carrying this type of body is listed at a price in excess of $3,000, and this will be found to be the fact this year as in former years, although there are fewer this year than last on account of the number that have switched to prices below this mark. There are 50 cars offered to the buying public this year, a drop of 12 per cent from the 60 listed in 1912, while the number of makers also has suffered a decline of 20 per cent.



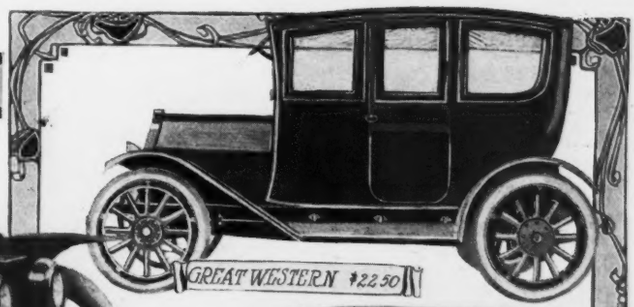
Low Priced Touring Cars

MORE care has been taken with these for carrying luggage, because it is this class of car that is used most for long-distance touring. Trunks at the rear are in considerable favor and in one instance, at least, the space under the forward seat has been utilized for carrying suitcases. This is the Matheson touring car, in which two suitcases are carried side by side under the front seat and can be drawn out onto the floor of the tonneau.

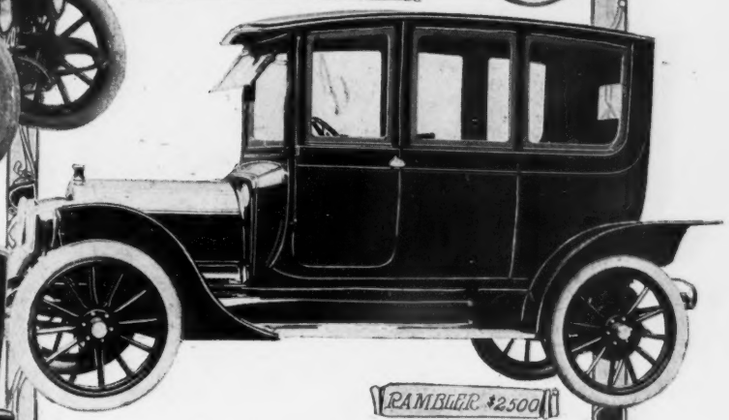
There has been a decided movement among manufacturers of seven-passenger touring cars toward a more uniform price, resulting, on the whole, in the lowering of the average price for this class of cars. The division of cars listed at a price between $2,000 and $3,000 has been increased by fully one-third since last year. Likewise there has been an increase of 400 per cent in the number of seven-passenger touring cars which may be obtained at a figure under $2,000.



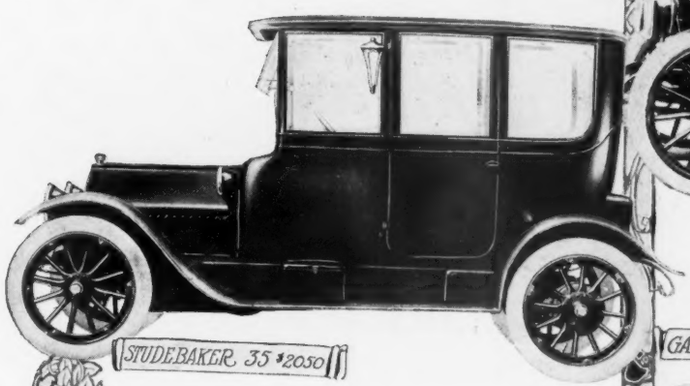
S-G-V. $4000



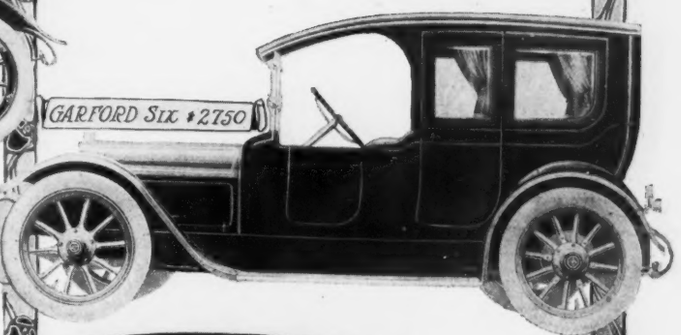
GREAT WESTERN $2250



RAMBLER $2500



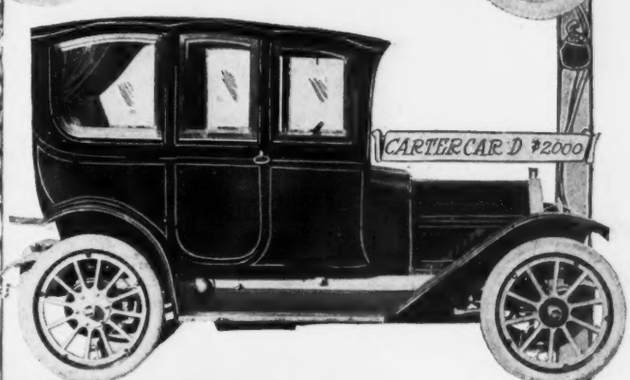
STUDEBAKER 35 $2050



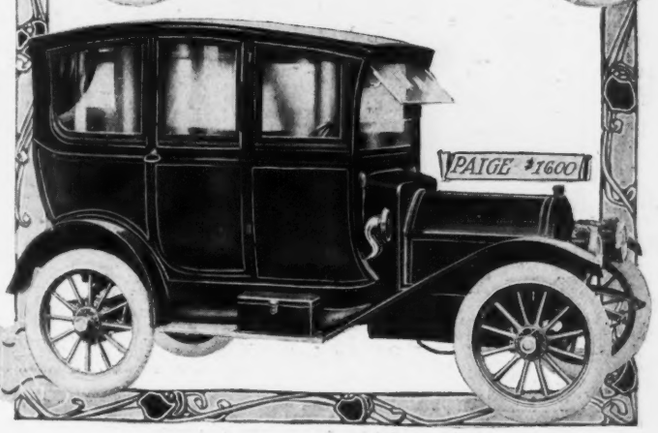
GARFORD SIX $2750

New Compartment Bodies

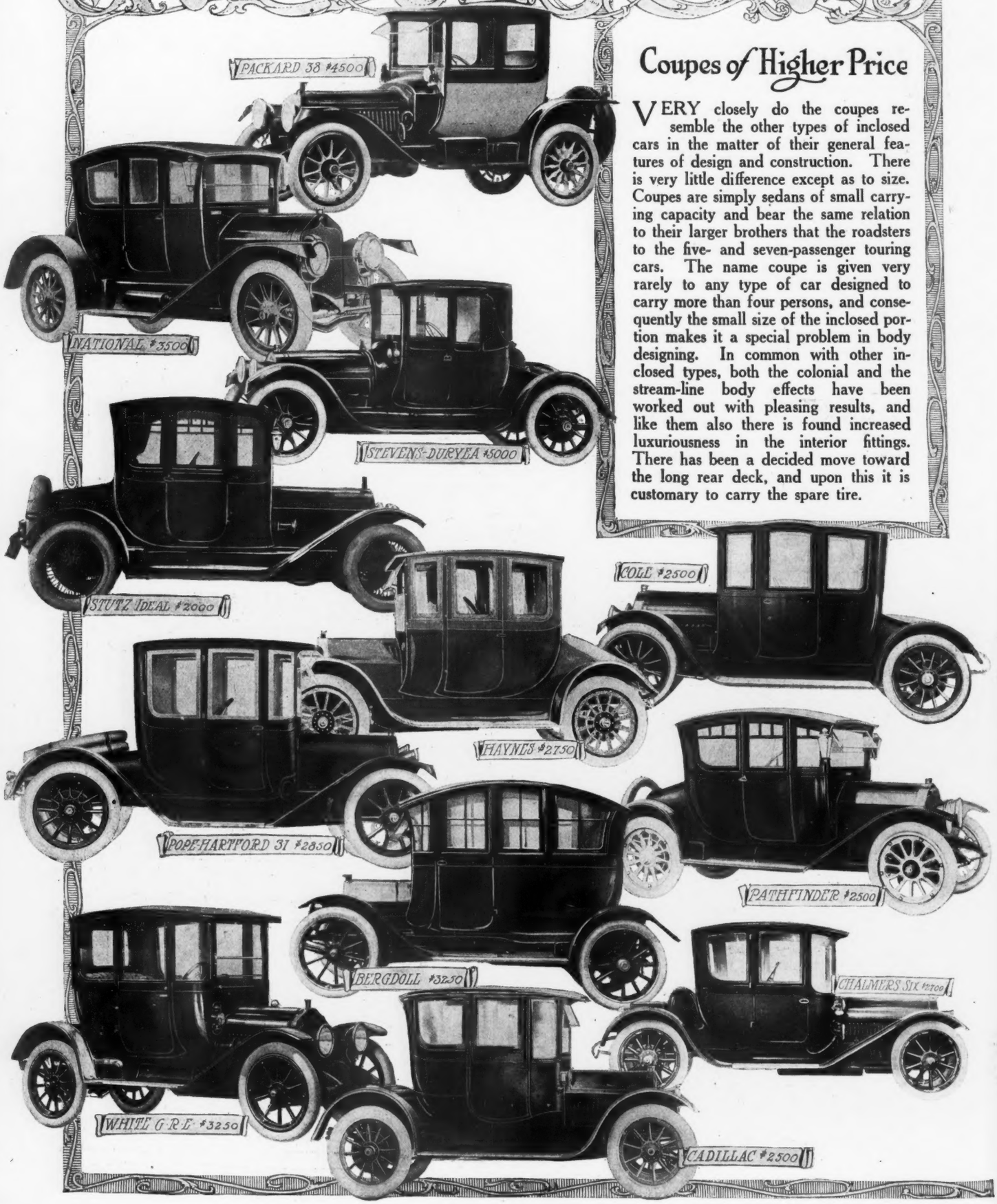
THE majority of the cars illustrated on this page typify the most recent development in body styles which has come to be known as the compartment body. This is the result of the demand of the owner-driver for an enclosed car in which the operator is not separated from his passengers. There usually is provided a partition between the front seat and the rear which may be pulled up to separate the driver if desired, at the same time giving him the protection of the enclosed body. The change during the past year has been mainly toward refinements in the matter of materials for covering the upholstery and side panels. The use of the bedford cord has increased and the tendency noted last year toward the use of colors and shades which will not show the dust has increased, although there is much done in the way of special colorings to match the shades affected by the occupants. Special fittings in the way of flower vases and disappearing cases for toilet articles, even book and newspaper holders, are in evidence. Of course, the fitting of electric cigar lighters has become almost standard in the better class of cars. The increase in comfort is noticeable from the adoption of deeper upholstery and longer springs.



CARTERCAR D $2000



PAIGE $1600

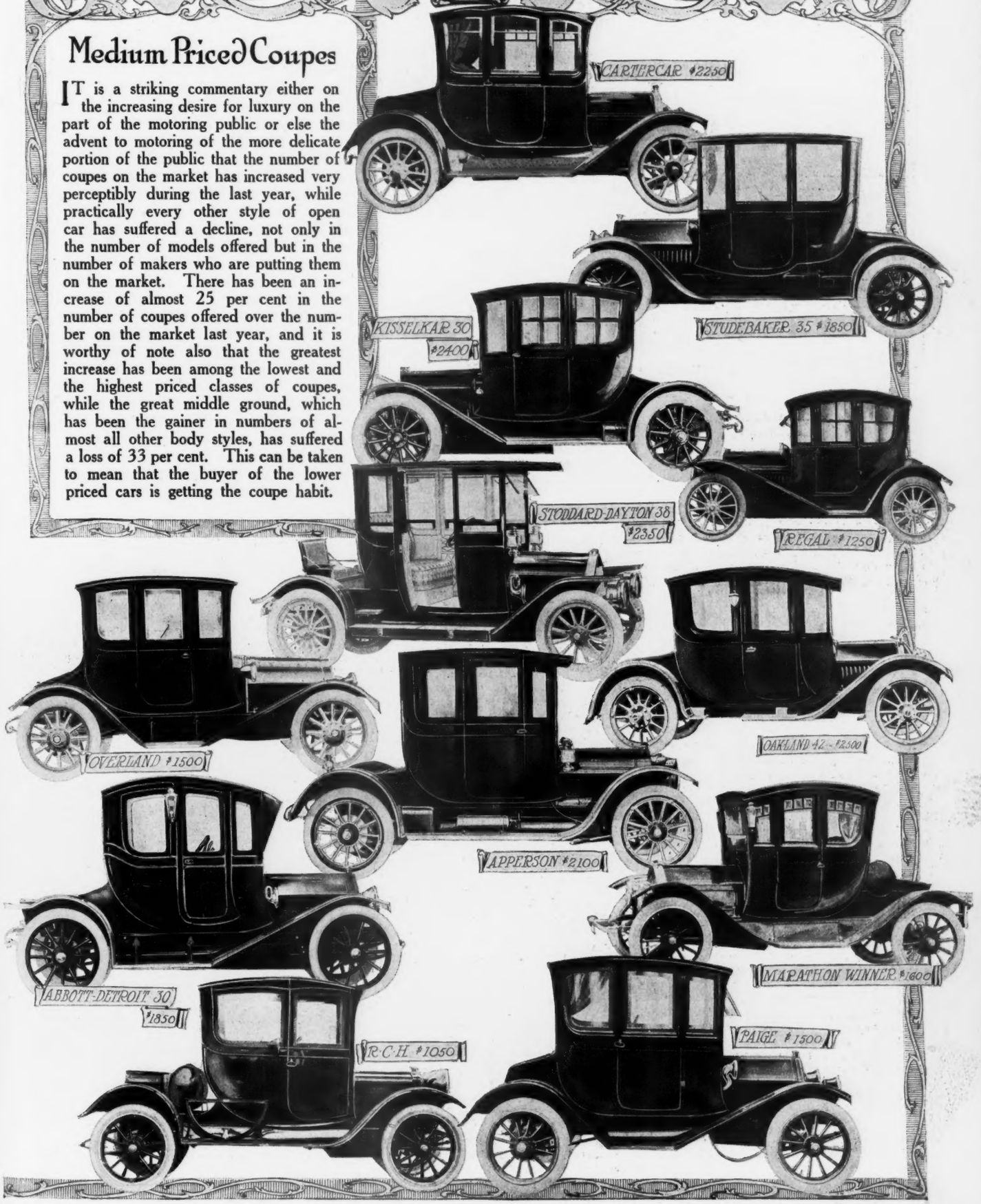


Coupes of Higher Price

VERY closely do the coupes resemble the other types of inclosed cars in the matter of their general features of design and construction. There is very little difference except as to size. Coupes are simply sedans of small carrying capacity and bear the same relation to their larger brothers that the roadsters to the five- and seven-passenger touring cars. The name coupe is given very rarely to any type of car designed to carry more than four persons, and consequently the small size of the inclosed portion makes it a special problem in body designing. In common with other inclosed types, both the colonial and the stream-line body effects have been worked out with pleasing results, and like them also there is found increased luxuriousness in the interior fittings. There has been a decided move toward the long rear deck, and upon this it is customary to carry the spare tire.

Medium Priced Coupes

IT is a striking commentary either on the increasing desire for luxury on the part of the motoring public or else the advent to motoring of the more delicate portion of the public that the number of coupes on the market has increased very perceptibly during the last year, while practically every other style of open car has suffered a decline, not only in the number of models offered but in the number of makers who are putting them on the market. There has been an increase of almost 25 per cent in the number of coupes offered over the number on the market last year, and it is worthy of note also that the greatest increase has been among the lowest and the highest priced classes of coupes, while the great middle ground, which has been the gainer in numbers of almost all other body styles, has suffered a loss of 33 per cent. This can be taken to mean that the buyer of the lower priced cars is getting the coupe habit.



Short Explanation of Terms Used in the

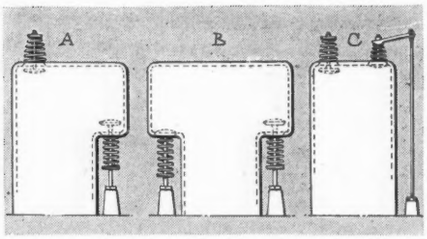


FIG. 1—THREE CYLINDER SHAPES

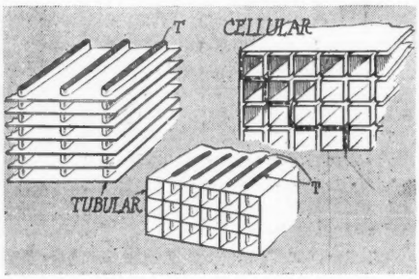


FIG. 2—TUBULAR AND CELLULAR RADIATORS

How to Use the Tables

THE specification table on the following pages and the buyers' guide were compiled with three objects in view, viz., to enable the prospective buyer to effect a better purchase or, better still, a purchase more suitable to his needs; second, to help the owner compare his car with those on the market for the ensuing year; and third, to create an interest in motor cars among readers in general.

Let us take the prospective purchaser as a first example. In the buyers' guide the motor cars are divided into classes according to price, and the intending purchaser should concentrate his efforts to the class in which are listed cars whose prices are within his means. For example, A wishes to purchase a car costing not more than $2,800. It must be a seven-passenger car with a certain wheelbase and equipped to his satisfaction. The buyers' guide is consulted, starting with the cars in the $1,000 class. All the vehicles living up to the requirements are taken from that class, and then the $1,500 class is looked over for cars that will answer the purpose. Since the $2,500 class includes cars whose prices are up to $2,999, this class too should be scanned. After all the seven-passenger cars with the desired wheelbase and equipment as to starter and lighting have been segregated, the next step is to compare the mechanical features of these various cars. This data is given in the table of specifications on pages 72 to 84.

In considering these features, the comparisons should be made with the cars as a whole—that is, simply because one make of car has a disk clutch that the intending buyer thinks is better than the cone or expanding band, is no reason why such a car is

BORE AND STROKE—In the column under this head is given the bore and stroke of the cylinders to the nearest $\frac{1}{100}$ inch. For example, a motor whose bore is $4\frac{5}{16}$ inches would be listed as a motor with a bore of 4.32. The line may read 4.32 x 5.50 which means that the bore, which is given first, is $4\frac{5}{16}$ and stroke $5\frac{1}{2}$ inches.

S. A. E. H. P.—Various formulas have been used for the horsepower rating of gas engines, but in these tables the horsepower is calculated from the formula adopted by the Society of Automobile Engineers, $\frac{D^2N}{2.5}$. The denominator is the constant that the engineers have concluded to be practical. D^2 is the square of the piston diameter or bore in inches and N is the number of cylinders. This data is omitted in the case of two-cycle motors because the S. A. E. formula refers to the four-cycle motor only.

Piston Displacement—The space the piston sweeps through in the cylinder during the stroke is known as the piston displacement of that cylinder and in the case of the motor's piston displacement, nothing remains but to multiply a single cylinder's displacement by the number of cylinders. Fig. 3 shows more clearly what is meant by displacement. B is the top dead center and C the top of the piston at the lower end of the stroke. A is the space swept out by the piston during its upward or downward journey and is the piston displacement of that cylinder. The volume of A is found by multiplying the square of the bore in inches by .7854 and this result by the stroke in inches.

Cylinder Shapes—The expressions, T-head, L-head and straight, refer to cylinders whose shape resembles the letters T, L and I. Fig. 1 shows that the shape of a cylinder conveys a number of things to the mind of the motorist. It is seen that in the L-head, A, the valves are all placed on one side and in the case of the T-head, B, on opposite sides. The straight or I-head cylinder, C, has the valves in the head, designated in the table by "Head." However, the L-head type is often designed with one valve in the head and the other in the side, as at A. The two-cycle engine always has cylinders of the straight type, the intake and exhaust openings in this case being ports or holes in the cylinder wall. The Knight type is also classed with the straight cylinders, the valves in this case being reciprocating sleeves.

Cylinders, How Cast—The method of casting requires little explanation. Separate refers to cylinders cast singly, pairs to those cast in blocks of two, threes to cylinders cast three at a time and block to those cast integrally or in one block.

Valve Types—Under this head we have the poppet, two-cycle and sleeve. The poppet or mushroom valve is the commonest, while the sleeve valves are gradually making their way to the front. Unless the words two-cycle appear, the motors operate on the four-cycle principle.

Valve Location—It will be seen that in the tables of specifications the valve location is given as right, left, opposite head, or left and head, etc. When right or left is mentioned, it means both valves are on the right or left hand of a person sitting in the seat. At any time when direction is stated it refers to that direction facing the motor from the seat. In the case of motors with valves in the head, designated in the table by head, is meant both valves in the head or top of the cylinder. Left and head and right and head will then seem evident. Opposite valve location occurs in motors with T-head cylinders. In this case the intake valves are on one side and the exhaust on the other.

Camshaft Drive—Under this head gear, chain, spiral, helical and worm are mentioned. When gear driven, a plain spur gear drives the camshaft. Spiral, helical and worm refer to these different types of gears and the chain drive is a silent chain operating the camshaft.

Cooling—The three methods of cooling, as shown in the specification tables, require little explanation. In the thermo-syphon system, advantage is taken of the fact that hot water will rise and in this system no pump is required. Where pump is mentioned, it means that the water is forced through its path by a pump. The air-cooled motor, instead of giving up its heat to water, transfers it directly to the air.

Radiator Type—The two types of radiators used are often mistaken for one another. The true cellular radiator, shown in Fig. 2, is composed of a great number of cells, through which the water may trickle. During its journey, which is a long one, shown by dotted line, the heat is absorbed by the cell walls. However, in the tubular type a number of fins are attached to a series of tubes, T, giving the appearance of a cellular radiator, but in reality the water remains entirely within the tubes.

Lubricating System—The splash system is one in which the ends of the connecting rods dip into the oil reservoir, in the crankcase and perhaps a pump used to bring the supply up to level. In the pressure system, oil is delivered directly from the oil tank to the bearings by means of a pump and pipe connections, no splash being used in this case. The splash-pressure system need not be explained, as it is a combination of the two foregoing. In the non-circulating system the oil is used but once, while it is used over and over again in the other systems.

Type of Lubricating Pump—Centrifugal pumps are called gear in the tables and consist of a gear with a hollow hub and holes between the long curved teeth. As the gear revolves the oil fed to the hub is pushed through the holes and forced upward by the teeth. The piston or plunger pump operates on the same principle as the tire pump. In a few cases wheel pumps are mentioned and these consist of a paddle wheel revolving in the oil reservoir.

Ignition System—The single system consists of one source of current and one set of spark plugs. The dual system consists of two sources of current, usually a battery and magneto and one set of plugs. The double system consists of a battery and magneto and two sets of plugs, with only

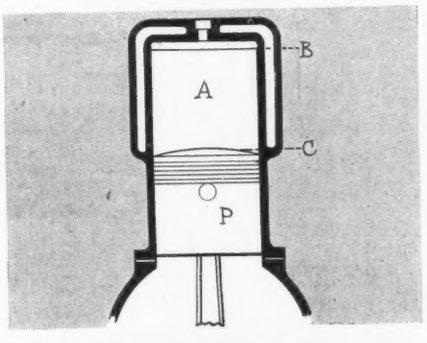


FIG. 3—ILLUSTRATING PISTON DISPLACEMENT

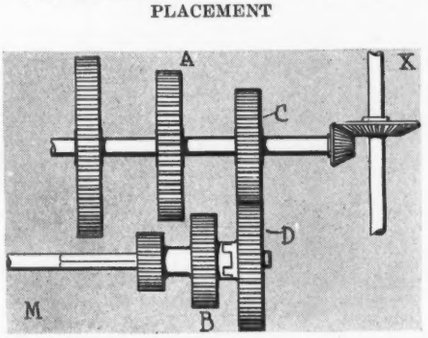


FIG. 4—THE MEANING OF GEAR RATIO

Specification Tables and Buyers' Guide

mechanically better. The reader should weigh in his mind each motor car and not consider one feature alone. Then, too, the matter of price enters largely into the selection. Design being a very desirable feature, it remains to study carefully the sketches shown in this issue.

For the owner who wishes to compare his car with those on the market for 1913 one very important point is to be remembered—that is, that a 1912 car is not out of date because the new models have some new mechanical contrivance that is highly spoken of by a number of other owners.

Since the industry is always progressing and working towards satisfying the owner, it remains that each year will bring about a number of changes. It must be borne in mind that prices vary each year and that if the owner at present has a car for which he paid $1,000 and it is listed in the buyers' guide of 1913 at $900, it does not mean that the 1912 purchase was a poor one. As facilities and production increase the list price decreases in proportion.

The third reason for compiling the buyers' guide and table of specifications—and this is a very important one—is for the purpose of educating the readers, tending to have them consider the various engineering principles and variety of design that the manufacturers of pleasure cars in America have adopted.

The reader should understand clearly just what is meant by the terms or expressions used in the tables, and this is all told either in text or sketch on these pages. Motor Age has endeavored to explain every word that may seem foreign to the reader in a clear, concise manner, and it simply remains to be given a reasonable amount of consideration.

one set sparking during motor operation. The fourth system mentioned, called dual 2 in the tables, requires the use of two sources of current and two sets of plugs. In this case both sets of plugs operate at once.

Magneto or Generator—When under this head the word optional is used, the manufacturer gives the buyer his choice of two or more makes. The Atwater-Kent system is merely a transformer set in which current from dry cells is passed through a booster coil, a high voltage resulting. When Delco, U. S. L., Esterline or Gray & Davis are mentioned, it means a dynamo system used for ignition and lighting and sometimes starting, as distinguished from the magneto generator used for ignition alone.

Control—Fixed control, though not very often used, is one over which the operator has no power. The spark is fixed so that it will occur at a given point in the cycle and cannot be changed without removing the magneto and retiming the motor. On the other hand, the governed control is one in which the spark automatically advances with motor speed and retards with a decrease in speed.

Fuel Feed—Under the gravity system the gasoline is fed by gravity from a tank situated above the spray nozzle of the carbureter. When the tank is below the spray nozzle, air pressure is required to force the fuel to the carburetor. This is known as the pressure system.

Clutches—Both dry-disk and disk clutches running in oil are classed in the tables as

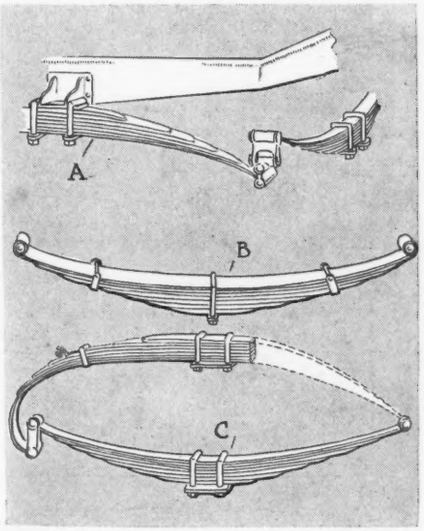


FIG. 5—FOUR TYPES OF SPRINGS: A, PLATFORM; B, SEMI-ELLIPTIC; C, THREE-QUARTER ELLIPTIC AND ELLIPTIC

disk. This also includes single-disk and multiple-disk. The cone clutch is familiar to all, while those of the expanding band and contracting band variety operate like the emergency brake; that is, two semi-circular bands of leather-covered metal either contract or expand against the flywheel.

Gearset Type—In the selective type of gearset any speed may be obtained without first going through any other speed. For example, in the selective gearset a shift may be made from first speed to high without passing through second. In the progressive, on the other hand, high speed cannot be obtained without first passing through the intermediate speeds, and by passing through is meant that the shifter gear meshes with the intermediate speed gears. Both the types mentioned are known as sliding gear transmissions. In the planetary gearset the gears are always in mesh, the entire transmission consisting of one big gear with internal teeth, having within it and meshing with these teeth one or more small gears. The friction transmission consists of a driven disk pressing against another disk, known as the driving disk, the latter, in turn, being attached to a shaft, which directly or indirectly turns the wheels.

Location Gearset—Unit with the rear axle, expressed as unit X in the table, refers to the gearset and differential housing being a unit. The expression unit M means that the motor and gearset housings are integral. In the case of amidships the gearset is midway between motor and rear axle.

Final Drive—In what is called bevel drive, the power is transmitted from the propeller shaft through bevel gears to the rear wheels and in the case of worm drive, gears of the worm type transmit the power to the rear wheels from the shaft. The chain drive does not take into consideration the driving gears which are enclosed in a jackshaft amidships. In this case the motive power is carried from the jackshaft to the rear wheels by means of one or more chains.

Car Drives Through—In Fig. 6, Tor T refers to torsion tube and in the diagram this is shown as a tube surrounding the driving shaft. The torsion rod is simply a bar of steel fastened at one end to the differential case and at the other to a cross member of the frame. Radius rods, shown as Rad. R in Fig. 6 are fastened to the frame and rear axle housing. In some cases all three devices are used, in others only one or perhaps two. When springs are mentioned, the car is propelled through the rear springs alone. If these various contrivances were not used to hold the rear end rigid the rear wheels would tend to pull the rear axle housing away from its fastenings.

Rear Axle—Four types of axles are used by car manufacturers. The dead axle will

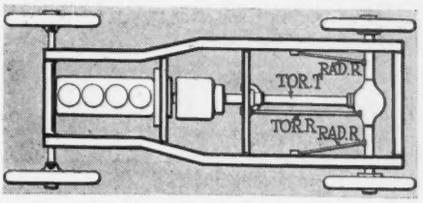


FIG. 6—METHODS OF PROPULSION

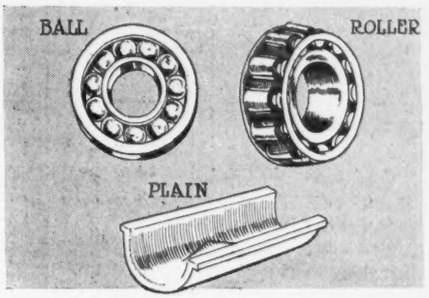


FIG. 7—BALL, ROLLER AND PLAIN BEARINGS

be found only on cars driven by two chains, one to each rear wheel, the axle in this case not turning. In the floating axle, the entire weight over the rear wheels rests on the axle housing and wheel hubs. The axle simply serves as a means of turning the wheels and carries no weight. In this case the axle bearings are in the wheels and it is a simple matter to remove the axle without first removing the wheels. In the case of the semi-floating axle the bearing is in the axle housing and the axle may not be removed without first removing the wheel and then the axle bearing. This type of axle is required to absorb some of the stress over the rear wheels. The three-quarter floating axle is the mean between the floating and the semi-floating the axle carrying part of the weight and the housing the rest. Most of the three-quarter floating axles are removable through the hub by leaving the wheel in place.

Gear Ratio—Crankshaft speed to wheel speed on high gear is what the figures in the table show; that is, if the gear ratio is given as 3.75-1, it means that the motor turns over 3.75 times to one revolution of the wheels on high. It is the relation of the speed of M to that of X in Fig. 4. The high speed gears C and D are always in mesh and have a ratio of one to one; that is, both gears have the same number of teeth. The gear ratio on second speed, in this case, would be the ratio between the number of teeth on gear A in the figure, and the one lettered B.

Springs—In Fig. 5 is shown the variety of springs mentioned in the table of specifications, B being of the semi-elliptic class, C of the three-quarter elliptic, and when the view takes in the dotted line also the elliptic spring. A shows clearly what is meant by platform suspension.

Front Axles—This hardly requires explanation, the I-beam being a solid axle, resembling the letter I, and the tubular a hollow tube.

Bearings—Three varieties of bearings are mentioned in the tables, plain, roller and ball. Fig. 7 illustrates the three types.

Chassis Weight—Although most of the chassis weights are given, these can only be taken to be correct to 90 per cent. for, in many cases the car weight was given and a 300 pound allowance was made for the body.

1913 Specifications of American

Complete Technical Details of Each of the Chassis Models of Passenger Vehicles Produced by American Makers for the 1913 Season, Including S.A.E. Horsepower Ratings of Each, and Piston Displacement in Cubic Inches

NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Abbott-Detroit, D	4	4.13x5.25	27.30	280.6	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Abbott-Detroit, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Adams-Farwell, 9	5	5.50x5.00	65.00	594.0	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Pressure	Noncir	Dual	Optional	Hand	Own	Pres	Lever	Own
A. E. C., 6-45	6	3.75x5.50	33.80	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Own
A. E. C., 6-60	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Air	
Alco, 7-16	4	3.94x4.25	24.00	207.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Sing	Bosch	Fixed	Stromberg	Grav		
Alco, 11-60	6	4.75x5.50	54.10	589.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Dual	Bosch	Hand	Newcomb	Pres		
Alpena, N-50	6	3.75x5.25	33.75	231.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
Alpena, P-40	4	3.75x5.25	22.50	372.1	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
American Scout, 22 A*	4	3.75x5.00	22.50	220.9	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Tour., 34 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Trav., 54 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Trav., 56 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Road., 32 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
Ames, 44 & 45	4	4.13x5.25	27.30	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Apperson, 4-45	4	4.50x5.00	32.40	318.1	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward L'd
Arbenz, F. G. H	4	4.13x5.50	27.30	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Gear	Dual		Hand	Schebler	Grav	Elec	
Atlas, 12	4	4.50x5.50	32.40	349.9	Knight	Pairs	Sleeve	Opp	Chain	Pump	Tub	Pressure	Piston	Sing	Deaco	Hand	Stromberg	Grav	Elec	Gray & Da.
Auburn, 33L	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 37L	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 40L	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-45	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-50	6	4.13x5.25	41.95	420.9	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Bosch	Hand	Schebler	Grav		
Austin, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 66	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 77	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Bergdoll, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L
Buick, 25, 24	4	3.75x3.75	22.50	165.5	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 31 30	4	4.00x4.00	25.60	201.1	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 40	4	4.25x4.50	28.90	255.3	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Burg, S	6	3.75x5.25	22.50	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Bosch	Hand				
Burg, R	6	4.13x5.25	22.30	420.9	L Head	Sep'rt	Poppet	Right	Gear	Pump	Cell	Spl-pres	Piston	Dual	Bosch	Hand				
Cadillac, 1913	4	4.50x5.75	32.40	365.8	L Head	Sep'rt	Poppet	Right	Chain	Pump	Tub	Splash		Doub	Delco	Hand	Own	Grav	Elec	Delco
Cameron, 29 A	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 28	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 30	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 32	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Carhartt, K	4	4.07x4.50	26.40	285.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash		Doub		Hand	Stromberg			
Carhartt, B	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet		Gear	Pump	Cell	Splash		Dual		Hand	Stromberg	Grav		
Carroll, 4 E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 4 D	4	5.00x5.00	40.00	392.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 6 C	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Cartercar, 5	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-pres	Noncir	Dual		Hand	Schebler	Grav	Elec	Jones
Case, N	4	4.13x5.25	27.25	420.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Opt	Remy	Hand	Rayfield	Pres		
Case, O	4	4.50x5.25	32.40	334.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Opt	Optional	Hand	Rayfield	Pres	Elec	Westinghse
Chadwick, 19—Road	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chadwick, 19—Touring	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chalmers, 17	4	4.25x5.25	28.90	297.8	Straight	Block	Poppet	L&H	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chalmers, 18	6	4.25x5.25	43.80	446.7	Straight	Threes	Poppet	L&H	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chevrolet, C	6	3.55x5.00	30.20	298.9	T Head	Threes	Poppet	Opp	Gear	Pump	....	Splash	Noncir	Dual		Hand		Grav	Air	English
Cino, 450	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	.....	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 440	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Hel'l	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 660	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav	Elec	Electro

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=⅛, .25=¼, .31¼=, .38=⅜, .44=7/16, .5=½, .56=9/16, .63=⅝, .69=11/16, .75=¾, .81=13/16, .88=⅞.

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ABBR

Gasoline Pleasure Vehicle Chassis

Specifications Include Every Mechanical Fact That Manufacturers, Dealers, and Buyers Require—Motor Design Specially Analyzed, Giving Engine Starters and Oiling Systems, Also Transmission, Running Gear and Control Features

TRANSMISSION								RUNNING GEAR									CONTROL			BEARINGS				
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,250
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	121	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,850
Cone	Sel	Amid	3	Chain	Rad. Rd	Semi F		120	36x4½	36x4½	Wood		½ Ell	½ Ell	Square	Right	Right	Right	Plain, 2	Ball	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Roll	Roll	2,000
Disk	Sel	Amid	4	Bevel	Rad. Rd	Float	2.63-1	138	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	2,500
Disk	Sel	Amid	3	Bevel	Rad. Rd	Float	3.80-1	104	32x4	32x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,420
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.61.1	133½	36x4½	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	3,560
Disk	Sel			Bevel	Springs	Float	3.50-1	135	36x4	36x4					I-Beam	Opt	Cent	Cent	Plain, 4	Plain	Ball	Ball	
Disk	Sel			Bevel	Springs	Float	3.50-1	135	36x4	36x4					I-Beam	Opt	Cent	Cent	Plain, 4	Plain	Ball	Ball	
Cone	Sel	Amid	3	Bevel	Tor T	Float	4.07-1	105	36x3½	36x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.02-1	124	40x4	41x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.29-1	140	41x4½	41x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Disk	Sel	Uint M	3	Bevel	Springs	Float	3.50-1	118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Ball	Ball	2,100
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	114	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	2,300
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	2,800
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	122	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	3,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,900
Disk	Sel	Unit X	3	Worm	Tor T	Float	3.85-1	130	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Ball	Ball	Roll	3,000
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.50-1	112	34x3½	34x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	2,500
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	115	35x4	35x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,850
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,950
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	130	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,100
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	135	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	3,450
Disk	Sel	Amid	4	Bevel	Springs	Float		141	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Springs	Float		141	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Springs	Float		141	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.75-1	115	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	2.80-1	121	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,600
Disk	Sel	Unit M	4	Bevel	Springs	Float	2.80-1	115	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.00-1	105	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	108	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	115	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	B&P	Ball	Ball	2,870
Disk	Sel	Unit M	3	Bevel	S & T T			124	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Opt	Cent	Pedal	Plain, 5	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	S & T T	Float	4.00-1	134	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 7	Ball	Ball	Ball	2,700
Cone	Sel	Amid	3	Bevel	S& T T	Float	3.50-1	120	36x4½	36x4½	Wood		½ Ell	¾ Plat	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	110	32x3½	32x3½	Wood		½ Ell	Ell	Tube	Right	Right	Cent	Plain, 3	Plain	Ball	Ball	1,700
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	104	32x3	32x3	Wood		½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,485
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	114	34x3½	34x3½	Wood		½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	120	34x3½	34x3½	Wood		½ Ell	Ell	Tube	Right	Cent	Cent	Plain, 3	Plain	Ball	Ball	1,800
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	109	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3		Roll	Ball	2,350
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	119	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3		Roll	Roll	2,950
Disk	Sel	Amid	4	Bevel	R & T R	Float		118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	2,850
Disk	Sel	Amid	4	Bevel	R & T R	Float		128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	3,500
Disk	Sel	Amid	4	Bevel	R & T R	Float		128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 5	Ball	Roll	Roll	3,750
	Fric			Chain	Rad Rd	Float		116	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Plain	Ball	Ball	2,350
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	115	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Plain	Ball	Ball	
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	125	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,500
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.00-1	112	36x4½	36x4½	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	2,700
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.25-1	133	36x4½	37x5	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,000
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Roll	Roll	Roll	2,774
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 3	Roll	Roll	Roll	3,173
Cone	Sel	Unit X	3	Bevel	Tor T	Float		120	35x4½	35x4½	Wood		½ Ell	¾ Plat	I-Beam	Left	Cent	Right	Plain, 3	Plain	Roll	Ball	
Cone	Sel		3	Bevel		Float		120	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	
Cone	Sel	Unit X	3	Bevel		Float	3.50-1	120	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,422
Cone	Sel		3	Bevel	S & T T	Float	3.75-1	132	36x4½	36x4½	Opt		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	3,560

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Specifications of American Pleasure Cars, Including Horsepower

NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Coey	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash		Dual		Hand	Schebler	Pres		
Colby, C	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Grav	Air	Thurber
Colby, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Pres	Air	Thurber
Colby, C-6-60	6	4.13x5.25	40.88	420.9	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Doub	Eisemann	Hand	Rayfield	Pres	Elec	Gray & Da.
Cole, 40	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 50	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 60	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Columbia, Mark 88	4	4.88x5.13	38.00	382.6	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Splash	Piston	Doub	Bosch	Hand	Stromberg	Pres		
Columbia, Mark 85	4	4.88x5.50	38.00	410.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Corbitt, D, E, & F	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	U. & H	Hand	Stromberg	Grav	Elec	Northeast
Correja, T & D	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, A, B & C	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Simms	Fixed	Schebler	Grav		
Correja, S & R	6	4.25x5.00	43.35	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, C & J	6	3.50x5.00	29.40	388.6	T Head	Threes	Poppet	Opp	Chain	Thermo	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres	Elec	
Correja, R & S	6	4.00x6.00	38.40	452.4	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres		
Crane, 3	6	4.38x6.25	45.94	563.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Pres	Air	Own
Crawford, 13-30	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Stromberg	Grav	Elec	Gray & Da.
Crawford, 13-40	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da.
Crow Elkhart, C-1	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-2-3-4, D-T	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-5	4	4.13x5.00	27.25	267.3	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav		
Crow Elkhart, C-7-8-9	4	4.50x5.00	32.40	318.1	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6A	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash		Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6-B	6	3.75x5.00	33.75	331.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Piston	Dual	Briggs	Hand	Stromberg	Grav	Elec	
Croxton, A	4	4.13x5.50	27.30	294.0	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Croxton, B6	6	4.25x5.50	43.80	468.0	L Head	Threes	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Cunningham, M	4	4.75x5.75	36.10	407.6	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Dual		Hand		Pres	Elec	
Cutting, 40	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Remy	Hand	Rayfield	Grav	Acet	Hanna
Davis, 40	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Davis, 50	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Day Utility, D	4	4.00x4.50	25.60	267.3	L Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash		Doub	Remy	Hand	Schebler	Grav		
Detroiter, A	4	3.38x4.75	18.25	170.0	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Kingston	Grav		
Diamond T, F	4	5.00x5.50	40.00	431.4	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Rayfield	Pres		
Dispatch, G-2	4	3.50x5.00		192.4	2 Cycle	Sep'rt				Air		Splash		Dual	Optional	Hand	Maco	Grav		
Dorris, H	4	4.38x5.00	30.73	300.7	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Splash	Gear	Sing	Bosch	Hand	Stromberg	Pres	Elec	Aplco
Duquesne, 50	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Preasure	Gear	Dual	Mea	Hand		Pres	Elec	
Duquesne, Six	6	3.75x5.50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Mea	Hand		Pres	Elec	
Duryea, Victoria	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Runabout	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Buggy	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Surry	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Edwards, 25	4	4.00x5.50	25.60	276.5	Knight	Pairs	Sleeve		Chain	Pump	Cell	Pressure	Piston		Simms	Hand	S.U	Pres	Elec	W. S. L.
Empire, Touring	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Eisemann	Fixed	Holley	Grav		
Enger, F, J, E	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Enger, P	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Falcar, 40	4	4.13x5.25	27.25	280.6	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres		Dual	Bosch	Hand	Rayfield	Grav		
Fiat, 54	4	4.40x6.00	30.63	371.2	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 56	6	4.40x6.00	45.95	556.8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 55	4	5.13x6.75	42.00	557.0	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Firestone-Col., 86E	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 60	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Conn	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 90	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Doub	Conn	Hand		Pres	Elec	Northeast
Flanders, 40	6	3.63x4.50	31.60	278.7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Flanders, 50	6	4.00x4.75	38.40	358.2	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Ford, T	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Sing	Own	Hand	Holley	Grav		
Franklin, G Run	4	4.00x4.00	25.60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, G Tour	4	4.00x4.00	25.60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, M	6	3.63x4.00	31.60	247.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin, D	6	4.00x4.00	38.40	301.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin, H	6	4.00x4.00	38.40	301.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Garford, 14	6	4.25x5.25	43.80	446.7	L Head	Threes	Poppet	Left	Spir'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand				
Garford, G15	6	3.75x6.00	33.75	397.5	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Bosch	Hand	Own	Pres	Elec	U. S. L.
Gleason, R	2	4.75x4.00	18.00	141.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Spl-Pres	Noncir	Dual	Remy	Hand	Schebler	Grav		
Glide, 36-42	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Acet	Disco
Glide, 45	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Eisemann	Hand	Schebler	Grav	Acet	Disco
Great Eagle, B	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell			Dual	Remy	Hand	Stromberg	Grav		
Great Eagle, C	6	4.13x5.25	40.90	420.9	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell			Dual	Remy	Hand	Rayfield	Grav		

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4 1/4, etc., .06=1/16, .19=3/16, .13=1/8, .25=1/4, .31=5/16, .38=3/8, .44=7/16, .5=1/2, .56=9/16, .63=5/8, .69=11/16, .75=3/4, .81=13/16, .88=7/8.

Rating, Starters and the Chassis Weight for 1913—Continued

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit X	3	Bevel	Tor T	Float		128	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Plain	Roll	Ball	2,100
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	118	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	128	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	32,00
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	138	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	34.00
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		116	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		122	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		132	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.75–1	129	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	Roll	Roll	3,800
Cone	Sel	Amid	3	Bevel	Springs	Float	3.38–1	120	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.85–1	120	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,200
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50–1	125	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain. 3	Roll	Roll	Roll	2,400
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00–1	105	34x3½	34x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00–1	125	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00–1	125	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50–1	125	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Roll	Roll	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00–1	135	36x4½	37x5	Wood		½ Ell	Plat		Right	Right	Right	Plain,7	Ball	Ball	Ball	3,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50–1	115	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50–1	125	36x4	36x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F		112	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	½Float		114	34x3½	34x3½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	½Float		122	35x4	35x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float		122	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	S & R R	Float		137	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	4.00–1	122	35x4½	35x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Roll	Ball	
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.00–1	121	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Plain	Ball	Roll	2,350
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	4.50–1	138	36x4½	36x4½	Wood		½ Ell	¾ Plat	I-Beam	Left	Cent	Cent	Plain, 3	Plain	Ball	Roll	2,750
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.43–1	124	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,200
Cone	Sel		3	Bevel	Rad Rd	Float	3.50–1	118	36x4	36x4	Wood		½ Ell	¾ Plat	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel		3	Bevel	Rad Rd	Float	3.50–1	118	36x4	36x4	Wood		½ Ell	¾ Plat	I-Beam	Right	Cent	Cent	Plain, 3	Ball	B&R	Ball	
Disk	Pro		3	Bevel	Springs	Float		115	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00–1	104	32x3½	32x3½	Wood		½ Ell	Plat	I-Beam	Left	Cent	Pedal	Ball, 2	Ball	Ball	Roll	2,000
Disk	Sel	Amid	3	Bevel	Tor R	Float		126	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
	Frict	Amid		Chain	S&RR	Dead	6.25–1	120	36x3½	36x3½	Wood		Ell	Ell	Tube	Right	Pedal	Right	Plain, 5	Roll	Roll	Roll	1,200
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.66–1	121	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Float		124	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Springs	Float		133	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Roll	Roll	2,700
	Frict	Unit X	2	Roller	Tor T	Dead		100	30x3	36x3	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	30x3	36x3	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	1½	1½	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		90	1½	1½	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00–1	120	36x4½	36x4½	Wire	Dem	½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	S & T T	Semi F		104	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	B&R	Ball	1,550
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50–1	120	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50–1	120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	S & R R	Float	3.50–1	116	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.33–1	123	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.50–1	135	36x4½	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,300
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.00–1	128	36x4½	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,150
Cone	Sel	Amid	3	Bevel	Springs	Float		116	34x4	34x4	Opt		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	Springs	Float		122	36x4	36x4	Opt		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float		130	36x4½	36x4½	Opt		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	¾Float	3.50–1	118	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Ball	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	¾ Float	3.75–1	130	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Roll	3,750
Disk	Plan	Unit M	2	Bevel	Tor T	Semi F	3.64–1	100	30x3	30x3½	Wood		Cross	Cross	I-Beam	Left	Pedal	Left	Plain, 3		Roll	Ball	1,000
Disk	Sel	Amid	3	Bevel	Springs	Semi F		100	32x3½	32x3½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R	Roll	1,800
Disk	Sel	Amid	3	Bevel	Springs	Semi F		103	32x4	32x4	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R	Roll	2,300
Disk	Sel	Amid	3	Bevel	Springs	Semi F		116	34x4½	34x4½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	2,400
Disk	Sel	Amid	3	Bevel	Springs	Semi F		123	36x4½	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	2,900
Disk	Sel	Amid	3	Bevel	Springs	Semi F		126	37x5	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	2.73–1	139	36x4½	37x5	Wood		½ Ell	½ Plat	I-Beam				Plain, 3	Ball	B&R	Roll	3,050
Cone	Sel	Unit M	4	Bevel	Tor T	Float		128	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	3,050
Disk	Sel	Unit M	3	Bevel	Tor R	Float	6.00–1	96	36x2	36x2	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	Plain	Roll	Ball	1,500
Disk	Sel	Unit M	3	Bevel	Springs	¾Float		118	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Ball	Ball	2,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float		120	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 6	Roll	Roll	Roll	2,800
Cone	Sel	Amid	3	Bevel		Float		135	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right					
Cone	Sel	Amid	3	Bevel		Float		142	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right					

ABBREVIATIONS:—**Clutch Type:** Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod. Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Specifications of American Pleasure Cars, Including Horsepower

MAKE AND MODEL	CYLINDERS				VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Great Southern, 30	4	4.00x4.50	25.60	226.6	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Great Southern, 51	4	5.19x6.00	43.00	507.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Opt	Optional
Great Western,	4	4.25x5.50	28.90	312.0	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Prestolite
Grout, 35	4	4.50x5.50	32.40	349.0	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Schebler	Grav	Elec	Ward-L'd
Grout, 45	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual		Hand	Schebler	Grav	Elec	Ward-L'd
Halladay, 32	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav		
Halladay, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Schebler	Grav	Elec	Jones
Havers, 44	6	3.75x5.00	33.75	330.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual		Hand	Stromberg	Pres	Acet	Disco
Havers, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Sing	Atw Kent	Hand	Stromberg	Pres	Elec	Northeast
Haynes, 22	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Stromberg	Grav	Elec	Leece-Nev
Henderson	4	4.13x5.25	27.25	420.9	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Rayfield	Grav	Acet	Disco
Herreshoff, 4-30	4	3.38x4.50	18.25	161.0	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav		
Herreshoff, 6-36	6	3.38x4.50	27.40	241.5	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav		
Holly, A	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Opt	Grav		Opt	
Hudson, 37	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hudson, 54	6	4.13x5.50	40.90	441.0	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hupmobile, C	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav		
Hupmobile, E	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav		
Hupmobile, H	4	3.25x5.50	16.90	182.5	L Head	Block	Poppet	Left	Chain	Thermo	Cell	Splash	Flywheel	Sing	Bosch	Hand	Zenith	Grav		
Imperial, 34	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Imperial, 44	4	4.75x5.25	36.10	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Interstate, 45	6	4.00x5.00	38.40	376.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Mea	Hand	Optional	Pres	Elec	Apico
Jackson, Olympic	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Jackson, Majestic	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Jackson, Sultanic	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Elec	
Keeton, 48	6	3.75x5.50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Gear	Sing	Bosch	Fixed	Own	Grav	Elec	
King, Roadster	4	3.83x5.13	22.50	226.4	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure		Dual	Briggs	Hand	Stromberg	Grav		
King, Touring	4	4.00x5.50	25.60	276.5	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure		Dual	Briggs	Hand	Stromberg	Grav		
Kisselkar, 30	4	4.25x4.25	28.90	241.1	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kisselkar, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kisselkar, 50	4	4.88x5.00	38.00	373.3	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kisselkar, 60	6	4.50x5.25	48.60	501.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Klinekar, 30	4	4.00x4.63	25.60	232.5	T Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Opt	Optional
Klinekar, 40	4	4.25x5.50	28.90	312.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Klinekar, 50	6	4.10x5.00	39.90	389.5	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Klinekar, 60	6	4.25x5.50	43.40	468.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand		Grav	Mech	Everready
Knox, 44	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 45	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 46	6	4.38x5.50	45.94	496.0	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Rayfield	Grav	Acet	Perkins
Knox, 66	6	5.00x5.50	60.00	646.7	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Krit, K	4	3.70x4.00	22.50	176.7	L Head	Block	Poppet	Right	Hel'l	Thermo	Tub	Splash	Piston	Sing	Bosch	Fixed	Stromberg	Grav		
Lambert, Buckeye, 40	4	3.25x5.25	16.90	174.2	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav		
Lambert, 99	4	4.25x5.25	28.90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Remy	Hand	Schebler	Grav		
Lenox, Four	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Own	Grav	Elec	Gray & Da.
Lenox, Six	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Piston	Sing	Mea	Hand	Own	Grav	Elec	Gray & Da.
Lexington, 13	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Doub		Hand		Pres	Elec	E. L. & S.
Lion, 30	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Right	Hel'l	Thermo	Cell	Splash	Piston	Dual	Remy	Hand	Own	Grav		
Little Four, A	4	3.50x3.38	19.60	129.9	L Head		Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Doub	Briggs	Hand	Kingston	Grav		
Little Six	6	3.32x4.25	23.06	220.3	L Head	Threes	Poppet	Side	Gear	Thermo	Tub	Splash	Noncir		Bosch	Hand		Grav		
Locomobile, L	4	4.50x4.50	32.40	286.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Locomobile, R	6	4.25x5.00	43.40	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Locomobile, M	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Lozier, 77	6	3.63x5.50	31.60	340.7	L Head	Threes	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
Lozier, 72	6	4.63x5.50	51.60	496.1	T Head	Pairs	Poppet	Opp	Spiral	Pump	Tub	Spl-Pres	Gear	Dual 2	Bosch	Hand	Own	Pres	Elec	Gray & Da.
Luverne, 760	6	4.25x5.25	43.40	446.7	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual		Hand	Schebler	Grav	Elec	Gray & Da.
Luck Utility	4	3.50x4.25	19.60	163.5	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Opt	Optional	Opt	Optional	Grav		
Marathon, Runner	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marathon, Winner	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marathon, Champion	4	4.50x5.13	32.40	326.1	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Marion, 36A & 37A	4	4.00x5.00	25.60	251.3	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Acet	Disco
Marion, 48A	4	4.13x5.50	27.25	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Elec	
Marmon, 32	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Grav	Elec	Northeast
Marmon, Six	6	4.50x6.00	48.60	572.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Pres	Elec	Northeast
Mason, A, B, C	2	5.00x5.00	20.00	196.4	Straight	Sep'rt	Poppet	Head	Gear	Pump	Tub	Splash		Dual	Spld'rf	Hand	Schebler	Grav		
Mason, K	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Schebler	Grav		
Matheson, C	6	4.50x5.00	48.60	477.1	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres	Elec	Westing'se

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual, 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric· Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4 1/4, etc., .06=1/16, .19=3/16, .13=1/8, .25=1/4, .31=5/16, .38=3/8, .44=7/16, .5=1/2, .56=9/16, .63=5/8, .69=11/16, .75=3/4, .81=13/16, .88=7/8.

Rating, Starters and the Chassis Weight for 1913—Continued

TRANSMISSION								RUNNING GEAR									CONTROL			BEARINGS				
	GEARSET								TIRES		WHEELS		SPRINGS											
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit M	3	Bevel	Tor T	Float		113	34x4	34x4	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 2	Ball	B&R	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Semi F		128	36x4	36x4½	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.53–1	118	36x4	36x4	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right.	Right.	Plain, 5	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Springs	Semi F		116	34x4	35x4½	Wood		½ Ell.	Plat	I-Beam	Right	Right.	Right.	Plain, 5	Roll	Roll	Ball	2,600
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		123	36x4	37x4½	Wood		½ Ell.	Plat	I-Beam	Right	Right.	Right.	Plain, 5	Roll	Roll	Ball	2,960
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.50–1	112	33x4	33x4	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Ball	Roll	Ball	2,650
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.50–1	118	36x4	36x4	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right.	Right.	Plain, 5	Ball	Ball	Ball	3,400
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75–1	122	36x4	36x4	Wood		½ Ell.	Plat	I-Beam	Right	Right.	Right.	Plain, 4	Ball	B&R	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50–1	128	36x4	36x4	Wood		½ Ell.	Plat	I-Beam	Right	Right.	Right.	Plain, 4	Ball	B&R	Ball	
Con Bd	Sel	Amid	3	Bevel	Tor T	Float	3.66–1	120	36x4½	36x4½	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Roll	Roll	Roll	2,340
Cone	Sel	Unit X	3	Bevel	Springs	Semi F	3.64–1	116	34x4	34x4	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Pedal.	Plain, 3	Ball	Roll	Ball	2,200
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00–1	100	34x4	34x4	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Pedal.	Plain, 3	B&P	B&R	Ball	1,600
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00–1	124	34x4	34x4	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Pedal.	Plain, 3	B&P	B&R	Ball	1,600
Cone	Sel	Unit X		Bevel	Tor T	¼Float	3.50–1	130	36x4½	36x4½	Wire	Dem	½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.90–1	118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Roll	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.43–1	127	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Roll	Roll	Roll	3,000
Disk	Sel	Unit M	2	Bevel	Rad Rd		4.50–1	86	30x3	30x3	Wood		½ Ell.	Cross	I-Beam	Right	Right.	Right.	Plain, 3	B&P	Roll	Roll	1,500
Disk	Sel	Unit M	2	Bevel	Rad Rd		4.50–1	110	30x3	30x3	Wood		½ Ell.	Cross	I-Beam	Right	Right.	Right.	Plain, 3	B&P	Roll	Roll	1,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.86–1	106	32x3½	32x3½	Wood		½ Ell.	Cross	I-Beam	Right	Cent.	Cent.	Plain, 3	B&R	Roll	Roll	1,800
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50–1	118	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	B&R	Roll	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50–1	122	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	B&R	Ball	
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.50–1	132	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50–1	115	34x4	34x4	Wood		Ell	Ell	I-Beam	Right	Right.	Right.	Plain, 3	Ball	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50–1	124	36x4	36x4	Wood		Ell	Ell	I-Beam	Right	Right.	Right.	Plain, 3	Ball	B&R	Ball	2,400
Cone	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50–1	138	36x4½	36x4½	Wood	Dem	Ell	Ell	I-Beam	Right	Right.	Right.	Plain, 4	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Float	Opt	131	36x4	37x4½	Wire	Dem	½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 4	Ball	Ball	Ball	3,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float		110	32x3½	32x3½	Wood		½ Ell.	Flat		Left	Cent.	Cent.	Plain				
Disk	Sel	Unit M	3	Bevel	Tor T	Float		115	34x4	34x4	Wood		½ Ell.	Flat		Left	Cent.	Cent.	Plain				
Cone	Sel	Amid	3	Bevel	Springs	Float	3.75–1	116	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75–1	121	35x4½	35x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75–1	132	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75–1	140	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Tor T	¾Float		115	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 5	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾Float		118	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 5	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾Float		126	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 7	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Tor T	¾Float		132	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50–1	122	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 5	Ball	Ball	Roll	2,300
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.30–1	126	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Opt	Cent.	Cent.	Plain, 5	Ball	Ball	Roll	2,740
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50–1	134	38x5	38x5	Wood		½ Ell.	¾ Ell.	I-Beam	Opt	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.00–1	134	38x5½	38x5½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	3,120
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00–1	106	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Left	Left	Left	Ball, 2	Ball	Roll	Ball	1 500
	Fric	Amid		Chain	Rad Rd	Semi F		112	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right.	Right.	Plain, 5		Roll	Ball	2,000
	Fric	Amid		Chain	Rad Rd	Semi F		117	34x3½	34x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right.	Right.	Plain, 5		Roll	Ball	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float		118	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float		130	35x4½	35x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.33–1	129	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00–1	110	32x3½	32x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Left	Cent.	Plain, 3	Roll	Roll	Ball	1,800
Cone	Sel		2		Springs	Semi F		90	30x3½	30x3½	Wood		½ Ell.	¾ Ell.	Tub	Right	Right		Plain, 3	Plain	B&R	Ball	1,640
Cone	Sel	Unit X	3	Bevel	T & R R	Semi F		106	32x4	32x4	Wood		½ Ell.	¾ Plat.	I-Beam	Left	Cent.	Right.	Plain, 3	Plain	Roll	Ball	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.54–1	120	34x4½	34x4½	Wood		½ Ell.	½ Ell.	I-Beam	Right	Right.	Right.	Plain, 3	Ball	Ball	Roll	3,430
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.54–1	128	36x4½	36x4½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 7	Ball	Ball	Roll	4,180
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.21–1	136	36x4½	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 7	Ball	Ball	Roll	4,380
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	3.75.1	127½	36x4½	36x4½	Wood		½ Ell.	½ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	2.76–1	131	36x4½	37x5	Wood		½ Ell.	Plat	I-Beam	Left	Cent.	Cent.	Ball, 4	Ball	Ball	Roll	2,990
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75–1	130	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Left	Plain, 5	Ball	B&R	Ball	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F		115	36x3½	36x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	B&R	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00–1	104	32x3½	32x3½	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00–1	116	34x4	34x4	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00–1	123	36x4	36x4	Wood		½ Ell.	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Cone	Sel	Unit X	3	Bevel	S & T T	Semi F	3.50–1	112	34x4	34x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Roll	Ball	2,540
Cone	Sel	Unit X	3	Bevel	S & T T	Float	3.50–1	120	36x4	36x4	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 3	Ball	Roll	Roll	2,865
Cone	Sel	Unit X	3	Bevel	Tor T	Float	Opt	120	35x4½	35x4½	Wood		½ Ell.	Ell	I-Beam	Left	Cent.	Cent.	Plain, 3	Ball	Ball	Roll	2,800
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	145	36x4½	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Left	Cent.	Cent.	Plain, 7	Ball	Ball	Roll	3,250
Cone	Plan	Unit M	2	Chain	Rad Rd	Dead	3.50–1	96	32x3½	32x3½	Wood		½ Ell.	Ell	Tube	Right	Right	Right	Plain, 2	Plain	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Semi F	3.50–1	116	36x3½	36x3½	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Right.	Right.	Plain, 2	Ball	Roll	Ball	
Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	3.00–1	135	37x5	37x5	Wood		½ Ell.	¾ Ell.	I-Beam	Right	Cent.	Cent.	Plain, 4	Ball	Ball	Roll	2,950

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Specifications of American Pleasure Cars, Including Horsepower

NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Maxwell, 4	4	3.75x4.00	22.50	176.7	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
Maxwell, 8	4	4.00x4.63	25.60	232.5	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
Maxwell, 10	4	4.25x5.25	28.90	297.8	T Head	Sep'rt	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
McFarlan, S	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	Stromberg	Pres	Air	Own
McFarlan, T	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Hel'l	Pump	Cell	Splash	....	Dual	Eisemann	Hand	Stromberg	Pres	Air	Own
McFarlan, M	6	4.25x5.00	43.40	425.4	Straight	Pairs	Poppet	Head	Hel'l	Pump	Cell	Splash	Flywheel	Dual	Eisemann	Hand	Stromberg	Grav	Air	Own
McIntyre, G	6	3.50x4.50	29.40	259.8	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	....	Hand	Stromberg	Grav	....	....
McIntyre	6	3.50x4.50	29.40	259.8	T Head	Block	Poppet	Opp	Spiral	Thermo	Cell	Splash	Piston	Dual	....	Hand	Stromberg	Grav	Elec	....
Mercer, J&K	4	4.38x5.00	30.63	300.7	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand	Fletcher	Pres	....	....
Mercer, G&H	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand	Fletcher	Pres	....	....
Metz, 22	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	....	Grav	....	....
Michigan, R & S	4	4.25x5.25	28.90	297.8	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Opt	....
Michigan, L & O	4	4.06x4.50	26.40	233.3	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Opt	....
Midland, T-4	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand	Optional	Pres	Elec	Gray & Da.
Midland, T-6	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand	Optional	Pres	Elec	Gray & Da.
Miller, 40	4	4.13x5.15	27.25	294.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Dual	Kingston	Hand	Chapin	Grav	....	....
Mitchell, 5-4	4	4.25x7.00	28.90	397.2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	....	Pres	Elec	Esterline
Mitchell, 5-6	6	3.75x6.00	33.75	397.5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	....	Pres	Elec	Esterline
Mitchell, 7-6	6	4.25x7.00	43.80	595.8	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	....	Pres	Elec	Esterline
Moline, M-40	4	4.13x6.00	27.25	327.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Noncir	Doub	Bosch	Hand	Schebler	Grav	Elec	Ward-Le'd.
Moon, 39	4	4.00x5.75	25.60	289.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Elec	Wagner
Moon, 48	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Elec	Wagner
Moon, 65	6	4.00x5.75	38.40	433.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Elec	Wagner
Morse	4	4.63x5.00	34.25	336.0	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Stromberg	Grav	Opt	Optional
Motorette, L, M & R	2	3.75x3.75	11.25	82.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Holley	Grav	....	....
Moyer, B &E	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand	Schebler	....	....	....
Moyer, D & F	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand	Schebler	....	....	....
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
Norwalk, A*	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand	Carter	Grav	Elec	Gray & Da.
Norwalk, A*	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand	Carter	Pres	Elec	Gray & Da.
Norwalk, B*	6	4.50x5.50	48.60	524.8	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing	....	Hand	Carter	Pres	Elec	....
Nyberg, 437	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand	Optional	Pres	....	....
Nyberg, 440	4	4.25x5.25	28.90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand	Optional	Pres	....	....
Nyberg, 645R	6	3.75x6.00	33.75	397.5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Optional	Pres	Elec	....
Nyberg, 645T	6	3.75x6.00	33.75	397.5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Optional	Pres	Elec	....
Nyberg, 660R	6	4.25x5.25	43.80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand	Optional	Pres	Elec	....
Nyberg, 660T	6	4.25x5.25	43.80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand	Optional	Pres	Elec	....
Oakland, 35	4	3.50x5 00	19.60	192.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Deaco	Hand	....	Grav	....	....
Oakland, 42	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Doub	Deaco	Hand	Schebler	Pres	Air	Own
Oakland, 6-60	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Piston	Doub	Deaco	Hand	Stromberg	Pres	Air	Own
Oldsmobile, 53	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	....	Sing	Delco	Hand	Stromberg	Pres	Elec	Delco
Omaha, 30*	4	4.06x4.50	26.40	233.3	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Spld'rf	Hand	Rayfield	Grav	....	....
Only, A	4	4.25x7.88	28.90	446.8	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Bosch	Hand	Own	Pres	....	....
Overland, 69	4	4.00x4.50	25.60	226.2	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Own
Overland, 71	4	4.38x4.50	30.63	270.6	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Own
Pacific Special, A & B	4	4.50x5.00	32.40	318.1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Acet	Prestolite
Packard, Runabout, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Touring, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Phaeton, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Runabout, 48	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	....	....
Packard, Touring, 48	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	....	....
Paige, 25	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Mayer	Grav	....	....
Paige, 36	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Chain	Pump	Tub	Spl-Pres	Piston	Sing	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Palmer-Singer, Brighton	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	C. R. G	Pres	Air	Own
Palmer-Singer, LXIV	6	4.88x5.50	57.00	615.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	C. R. G	Pres	Air	Own
Paterson, 43	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand	Schebler	Grav	Elec	Deaco
Paterson, 47	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand	Schebler	Grav	Elec	Deaco
Pathfinder	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Eisemann	Hand	Schebler	Grav	Elec	Gray & Da.
Peerless, 29	4	4.00x4.63	25.60	232.5	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Grav	....	....
Peerless, 35	6	4.00x5.50	38.40	414.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Peerless, 36	6	4.50x6.00	48.60	572.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Peerless, 37	6	5.00x7.00	60.00	824.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Perfex, 2	4	3.75x4.50	22.50	198.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Spld'rf	Hand	Stromberg	Grav	....	....
Pierce-Arrow, 38C	6	4.00x5.50	38.40	414.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Own	Grav	Air	Own
Pierce-Arrow, 48D	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Pierce-Arrow, 48B	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Own	Grav	Air	Own
Pierce-Arrow, 66A	6	5.00x7.00	60.00	824.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Grav	Air	Own

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributor; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=1/8, .25=1/4, .31=5/16, .38=3/8, .44=7/16, .5=1/2, .56=9/16, .63=5/8, .69=11/16, .75=3/4, .81=13/16, .88=7/8.

Rating, Starters and the Chassis Weight for 1913—Continued

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Pro	Unit M	3	Bevel	Springs	Semi F	3.50–1	93	30x3½	30x3½	Wood		½ Ell	¾ Ell	Tub	Left	Cent	Cent	Plain, 3	P&R	B&B	Ball	1,550
Disk	Pro	Unit M	3	Bevel	Springs	Semi F	3.82–1	106	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	B&R	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50–1	115	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 5	P&R	Roll	Roll	2,900
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	124	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 3	B&R	Ball	Ball	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	124	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 4	B&R	Ball	Ball	2,400
Disk	Sel	Unit M	3	Bevel	T & R R	Float	Opt	128	37x4½	37x4½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,600
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.43–1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	P&B	Ball	Roll	2,100
Disk	Sel	Unit M	4	Bevel	S & T T	Float	3.43–1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	P&B	Ball	Roll	2,100
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		108	32x4	32x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,550
	Frict	Amid	5	Chain	Rad Rd	Dead	3.00–1	90	30x3	30x3	Wood		Ell	Ell	Tube	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Springs	Float	3.50–1	118	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50–1	114	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 2	Roll	Roll	Ball	2,850
Disk	Sel	Amid	3	Bevel	Springs	Float	3.75–1	121	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,650
Disk	Sel	Amid	3	Bevel	Springs	Float	3.00–1	134	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	3,600
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F		116	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Right	Opt	Cent	Plain, 3	Plain	Roll	Ball	2,300
Cone	Se	Amid	3	Bevel	Tor T	Float	3.60–1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&R	Roll	Roll	2,800
Cone	Se	Amid	3	Bevel	Tor T	Float	3.60–1	132	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	B&R	Roll	Roll	3,400
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.60–1	144	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	B&R	Roll	Roll	3,800
Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	3.50–1	124	36x4	36x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,225
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50–1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Roll	
Disk	Sel	Amid	3	Bevel	Springs	Float		121	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Opt	Opt	Opt	Plain, 3	Ball	B&R	Roll	2,700
Disk	Sel	Amid	3	Bevel	Springs	Float	3.38–1	132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	
Disk	Sel	Amid	4	Bevel	Tor T	Semi F		127	36x4½	36x4½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,650
Cone	Plan	Unit M	2	Chain	Springs	Dead	4.50–1	72	28x3	29x3½	Wood		Ell	½ Ell	I-Beam	Right	Right	Pedal	Plain, 2	Plain	Ball	Ball	970
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		117	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Ball	Ball	2,800
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		122	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Springs	Float	3.00–1	128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,700
Cone	Sel	Amid	3	Bevel	Springs	Float	3.21–1	128	36x5	36x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,700
Cone	Sel	Amid	3	Bevel	Springs	Float	2.64–1	120	34x4½	34x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.78–1	127	38x4½	38x4½	Wood		½ Ell	½ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,100
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.72–1	136	40x4½	40x4½	Wood		½ Ell	½ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,360
Disk	Sel	Unit M	4	Bevel	Springs	Float		144	41x5	41x5	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,635
Disk	Sel	Unit M	3	Bevel		Float	3.50–1	118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50–1	118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50–1	126	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel		Float	3.50–1	136	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50–1	128	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 7	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50–1	138	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 7	Ball	Ball	Ball	
Cone	Sel	Unit M	3	Bevel	Springs	Semi F	3.50–1	112	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,350
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00–1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,350
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00–1	130	34x4½	34x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,900
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.75–1	135	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,700
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.50–1	116	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	B&R	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Float		112	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Ball, 4	Ball		Ball	2,400
Cone	Sel	Unit X	3	Bevel	S & T T	¼Float	Opt	110	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Roll	1,900
Cone	Sel	Unit X	3	Bevel	S & T T	Float	Opt	114	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	Roll	Roll	2,100
Disk	Sel		3	Bevel	Tor T	Float	3.50–1	121	34x4	34x4	Wood				I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,700
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80–1	115½	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80–1	134	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80–1	138	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Left	Left	Plain, 7	Ball	Ball	Roll	3,500
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80–1	121½	36x4½	37x5	Wood		½ Ell	¾ Ell	Tub	Right	Right	Right	Plain, 4	Ball	Ball	Roll	4,050
Disk	Pro	Unit X	3	Bevel	T & R R	Semi F	3.80–1	139	36x4½	37x5	Wood		½ Ell	¾ Ell	Tub	Right	Right	Right	Plain, 4	Ball	Ball	Roll	4,050
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F	4.00–1	110	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	B&R	B&R	Ball	2,180
Disk	Sel	Unit M	3	Bevel	Rad Rd	¼Float	3.53–1	116	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&R	B&R	Ball	2,700
Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	3.69–1	127	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,510
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.30–1	138	36x4	36x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Roll	2,929
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00–1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,700
Cone	Sel	Unit M	3	Bevel	Springs	Float	4.00–1	122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Unit M	3	Bevel	Tor T	Float	Opt	120	36x4	36x4	Opt		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	2,300
Exp Bd	Sel	Amid	4	Bevel	Tor T	Float		113	34x4½	34x4½	Wood		½ Ell	Plat	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	3.60–1	125	36x4½	36x4½	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	3.20–1	137	36x4½	37x5	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,750
Exp Bd	Sel	Amid	4	Bevel	Rad Rd	Float	2.60–1	140	38x5½	38x5½	Wood		½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F		106	32x3½	32x3½	Wood		Ell	Ell	I-Beam	Right	Cent		Plain, 3		Ball	Ball	1,800
Cone	Sel	Amid	4	Bevel	Springs	Semi F		132	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,030
Cone	Sel	Amid	4	Bevel	Springs	Semi F		134½	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,335
Cone	Sel	Amid	4	Bevel	Springs	Semi F		142	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,510
Cone	Sel	Amid	4	Bevel	Springs	Semi F		147½	37x5	38x5½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,980

ABREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Specifications of American Pleasure Cars, Including Horsepower

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Pilot, 50	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pilot, 60	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pope-Hartford, 31	4	4.32x5.13	30.90	299.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual		Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 33	4	4.75x5.50	36.10	389.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 29	6	4.32x5.38	46.35	471.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pratt, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual	Deaco	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 40	4	4.50x4.75	32.40	302.2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 50	4	4.50x5.75	32.40	365.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Elec	Gray & Da.
Premier, 6-40	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Optional	Grav	Air	Own
Premier, 6-60	6	4.50x5.25	48.60	501.0	T Head	Pairs	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Carter	Grav	Air	Own
Pullman, 36	4	4.06x5.00	26.40	259.2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav		
Pullman, 44	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Pullman, 66	6	4.50x5.50	48.60	523.5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Rambler, Cross-Country	4	4.50x4.50	32.40	286.3	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Piston	Sing	U.S.L	Hand	Stromberg	Grav	Elec	U. S. L.
Rayfield, C	6	3.50x5.50	29.40	317.4	T Head	Pairs	Poppet	Opp	Chain	Thermo	Cell	Pressure		Sing	Mea	Hand	Rayfield	Pres		
R. C. H.	4	3.25x5.00	16.90	165.9	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Wheel	Sing	Bosch	Fixed	B. D	Grav		
Reeves, Sextoauto†	4	4.75x5.50	36.10	389.9	T Head		Poppet	Opp	Gear	Pump	Cell	Pressure		Dual	Eisemann	Hand	Optional	Grav		
Regal, T & N*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, Coupe*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, H*	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, C	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Schebler	Grav		
Reo, The Fifth	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	S&H	Gear	Pump	Tub	Spl-Pres	Piston	Dual	National	Hand	Holley	Grav	Acet	Own
Republic, D	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Grav		
Republic, E	6	4.25x5.00	43.35	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Pres	Elec	Delco
Richmond, O	4	4.00x4.50	25.60	251.3	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Opt	Optional
Richmond, P	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Elec	
Schacht, NS, KL	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Spi'l	Pump	Cell	Spl-Pres	Piston	Dual		Hand	Optional	Grav	Elec	
Schlosser	4	5.00x6.00	40.00	471.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Noncir	Dual	Bosch	Hand	G. & A	Pres		
Selden, 48	4	4.75x5.00	36.10	354.4	L Head	Pairs	Poppet	Left	Spir'l	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Disco
S. G. V., A	4	3.75x4.38	22.50	193.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Fixed	Own	Pres		
S. G. V., D	4	4.00x5.25	25.60	263.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Hand	Own	Pres		
Simplex, 127	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 137	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 129	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Dosch	Hand	Own	Pres	Acet	Disco
Simplex, 139	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Spaulding, G	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Eisemann	Hand	Schebler	Grav	Elec	Gray & Da.
Speedwell, G	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Left	Hel'l	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Schebler	Pres	Elec	Aplco
Speedwell Rotary	6	4.13x5.25	40.90	420.9	Mead	Threes	Rotary	Opp		Pump	Cell	In Fuel		Dual	Bosch	Hand	Schebler	Pres	Elec	Wagner
Spoerer, 40-C	4	4.88x5.50	38.00	410.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Spoerer, 25-A	4	4.13x5.50	27.25	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Staver, 45	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 45	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 65	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Rayfield	Pres	Air	Own
Stearns, Knight, 4	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 4 Road	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, Light Tou	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 6 Road	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stearns, Knight, 6	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stevens-Duryea, C	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stevens-Duryea	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stoddard-Day, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day 38	4	4.25x5.13	28.90	290.7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day, 48	4	4.75x5.00	36.10	354.4	Straight	Pairs	Poppet	S&H	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Stoddard-Day, Knight	6	4.50x5.50	48.60	524.8	Knight	Threes	Sleeve	Opp	Chain	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Studebaker, 20	4	3.62x3.75	20.30	154.8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 25	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	
Studebaker, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 35	4	4.13x5.00	27.25	267.3	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Studebaker, Six	6	3.50x5.00	29.40	288.6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Stutz, 4 Bearcat	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 4 Touring	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 6 Bearcat	6	4.25x5.00	43.80	425 4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Spld'rf	Hand	Stromberg	Grav		
Stutz, 6 Touring	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Stromberg	Grav		
Touraine, Race	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 6	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 7	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Triumph, A&B	4	4.75x5.50	36.10	389.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Air	Own
Velie, Dispatch	4	3.75x5.50	22.50	231.1	L Head	Block	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=$\frac{1}{16}$, 19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=¼, .31=$\frac{5}{16}$, .38=⅜, .44=$\frac{7}{16}$, .5=½, .56=$\frac{9}{16}$, .63=⅝, .69=$\frac{11}{16}$, .75=¾, .81=$\frac{13}{16}$, .88=⅞.

Rating, Starters and the Chassis Weight for 1913—Continued

TRANSMISSION								RUNNING GEAR									CONTROL			BEARINGS				
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50–1	126	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,400
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50–1	132	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,600
Cone	Sel	Amid	4	Bevel	Springs	Float		118½	38x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float		124	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Plain	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float		133	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	
Disk	Sel		3	Bevel	Rad Rd	¼Float		114	34x3½	34x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Ball	
Cone	Sel		3	Bevel	Rad Rd	Float		120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Disk	Sel		3	Bevel	Springs	Float		122	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Amid	3	Bevel	S & T R	Semi F		132	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Roll	3,000
Disk	Sel	Amid	3	Bevel	S & T R	Semi F		139	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	3,200
Cone	Sel	Amid	3	Bevel	Springs	Float		118	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	4	Bevel	Springs	Float		122	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	
Cone	Sel	Amid	4	Bevel	Springs	Float		138	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.71–1	120	36x4	36x4	Wood	Dem	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.44–1	117	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	4.25–1	110	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Left	Cent	Cent	Plain, 2	P&R	B&R	Ball	1,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float		158	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right		Ball	Roll	Roll	
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.70–1	108	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00–1	100	32x3½	32x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,365
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.50–1	118	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,650
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00–1	116	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	
Disk	Sel	Amid	3	Bevel	Springs	Semi F	3.75–1		34x4	34x4	Wood				I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,700
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.50–1	120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Amid	4	Bevel	Springs	Float	3.00–1	132	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Pedal	Plain, 5	Ball	Ball	Ball	3,300
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20–1	112	34x3½	34x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Ball	
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20–1	120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Ball	
Cone	Sel	Amid	3	Bevel	Springs	Float		120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float		124	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50–1	125	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,370
Disk	Sel	Amid	4	Bevel	Springs	Semi F		116	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F		118	35x4½	35x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75–1	127	35x5	35x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75–1	137	35x5	35x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,825
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13–1	129	36x4	36x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,910
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13–1	139	36x5	36x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,925
Cone	Sel	Amid	3	Bevel	Springs	Float		120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.00–1	134	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	3,490
Disk	Sel	Amid	3	Bevel	S&TT	Float	3.36–1	134½	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Roll	Roll	3,300
Cone	Sel	Amid	3	Bevel	Rad Rd	Float		120	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F		120	35x4	35x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,300
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50–1	113	34x4	34x4	Wood		½ Ell	Ell	Tub	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,250
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50–1	116	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,300
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50–1	120	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,575
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50–1	124	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Springs	Float	3.50–1	136	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Ball	Ball	Ball	2,950
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90–1	127	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90–1	116	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90–1	121	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	4	Bevel	Springs	Float	3.40–1	134	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.40–1	140	37x5	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70–1	131	37x4½	37x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70–1	138	37x4½	37x5	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00–1	112	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.53–1	114	35x4½	35x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.30–1	122½	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	3,700
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50–1	133	36x5	36x5	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 7	Ball	B&R	Roll	4,400
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F		102	32x3	32x3	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	B&R	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58–1	101	30x3½	30x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58–1	112	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	B&R	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58–1	115½	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58–1	121	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	120	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,500
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	130	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,500
Disk	Sel		3	Bevel	Tor T	Float		114	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel		3	Bevel	Tor T	Float		124	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel		3	Bevel	Tor T	Float		133	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.33–1	114	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Unit X	3	Bevel	Springs	Semi F		113	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&P	Roll	Ball	2,150

ABBREVIATIONS:—**Clutch Type:** Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Specifications of American Pleasure Cars, Including Horsepower

NAME AND MODEL	No. of Cylinders.	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
					Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Velie, 32	4	3.75x5.50	22.50	231.1	L Head	Block.	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Spld'rf	Hand.	Stromberg	Grav		
Velie, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs.	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Pres	Elec	Gray & Da.
Warren, Wolverine	4	4.13x4.50	27.25	240.5	L Head	Block.	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Doub.	Bosch	Hand.	Stromberg	Grav		
Warren, Pilgrim	4	4.25x4.75	28.90	269.4	L Head	Block.	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand.	Stromberg	Opt		
Warren, Resolute	6	4.00x5.00	38.40	376.9	L Head	Block.	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand.	Stromberg	Pres	Elec	Northeast
Westcott, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Connectic't		Schebler	Grav	Elec	Electro
Westcott, 50	6	4.00x6.00	38.40	452.4	T Head	Block.	Poppet	Opp	Gear	Pump	Cell	Splash		Sing	Electro			Grav	Elec	Electro
White, GRE	4	3.75x5.13	22.50	226.4	L Head	Block.	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand.	Own	Grav	Elec	Own
White, GEB	4	4.25x5.75	28.90	326.3	L Head	Block.	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand.	Own	Grav	Elec	Own
White, GF	6	4.25x5.75	43.80	489.4	L Head	Block.	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand.	Own	Grav	Elec	Own
Winton, 17D	6	4.50x5.00	48.60	477.2	L Head	Pairs.	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand.	Stromberg	Grav	Air	Own
Zimmerman, Z-40	4	4.32x5.00	30.25	292.1	L Head	Pairs.	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual		Fixed	Schebler	Grav		
Zimmerman, Z-6	6	3.75x5.00	33.75	331.4	L Head	Pairs.	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Deaco	Hand.	Schebler	Pres		
Amplex F**	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand.	Rayfield	Pres	Elec	Northeast

*Underslung Frame. †Has six wheels. **Too late to classify.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=⅛, .25=¼, .31=5/16, .38=⅜, .44=7/16, .5=½, .56=9/16, .63=⅝, .69=11/16, .75=¾, .81=13/16, .88=⅞.

American Designers Study Problem of Seating the Driver

Advantages and Disadvantages of Right and Left-Hand Steering and Control Lever Location Discussed and Analyzed—Tabulations Showing the Practice for the Year

THERE has been a great deal of discussion among motor car engineers and also among the buying public as to the relative advantages of right, or left location of the steering wheel, or rather the right or left location of the driver. Along with this there has been an equal amount of argument as to whether or not it is better that the gearshift and emergency brake levers be operated with the right hand or the left. It is one of the evidences of the development of the motor car from its predecessor, the horse-drawn vehicle, that the driver of the early car was seated upon the right side, because the horseman almost of necessity must be seated upon the right in order to afford better use of his whip as the right hand was always considered the whip hand. But when motor car makers went so far as to place the control levers also on the right side, where they had to be operated by the driver's right hand they departed from the custom of horse drivers of using the left-hand for controlling their power plant—the horse. Consequently, the move of many makers in using right-hand steering with the control levers in the center where they may be operated by the left hand has been a step towards first principles as developed in horse-drawn vehicles.

Center Control Arguments

There are a great many arguments for the use of the center control when the driver is seated upon the right, particularly as most motorists are right-handed. It is felt by many that the right hand, the one over which the average man has the better control, should be reserved for the more delicate operation of steering, particularly at the ticklish times when it is necessary to use the emergency brake or make a quick gear shift. On the other hand, advocates of the older type of right-hand drive with right-hand control claim that when the emergency brake is needed, it should be in a position where it can be operated as positively and quickly as possible, that is, by the hand possessing the most dexterity, which usually is the right hand.

Right or Left Steer

As between the location of the driver upon the right side or the left side, there is an opportunity for a great deal more discussion than can be indulged in here, but the most potent arguments of the left-hand steering adherents are that in city use where the rule of the road demands that the car stop on the right side of the street; that is, with the right side toward the curb, ingress and egress to the front seat are prevented if the steering wheel is on the right side. Whereas, with the steering wheel on the left side a direct exit to the curb is afforded for both front-seat passengers. It also is argued that in passing vehicles on the right the driver can better judge his distance from the one he is passing, when the other vehicle is going in the opposite direction. In passing vehicles going in the same direction, he is on the proper side to observe whether or not there are others going in either direction in front of the one that is attempting to pass. Also, in making turns the driver of the left-hand driven car is on the high side of the road. In drawing away from the curb the left-hand driver is in position to observe the cars which may be passing. Further, with the driver on the left side, the control levers may be placed in the center of the car and yet be convenient for right-hand manipulation.

But there is another side of the question, as there is to any question. The advocates of right-hand drive advance the following points:

In passing to the right of another vehicle, especially in a country road, the driver of a right-hand driven car is in a position to see how close to the ditch he may allow himself to approach. In passing to the left, the driver is closer to the car he is passing.

Advantages of Old Style

In turning to the right, the driver if on the right side of the car is able to see how close he is coming to the curb.

In drawing up to the curb, the driver is closer to the curb on the right, and therefore can observe how close he is to it. He also can open the tonneau door from this side, while in the left-hand drive arrangement, the passengers must open the door themselves, or the driver must climb out to open it for them.

The majority of drivers are accustomed to right-hand driving, and hence would find left-hand drive awkward.

It was not very long ago when left-hand drive and center control seemed ridiculous and it was thought by some that the public's demand for this feature was only temporary, but glancing

Rating, Starters and the Chassis Weight for 1913—Concluded

TRANSMISSION								RUNNING GEAR									CONTROL			BEARINGS				
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Unit X	3	Bevel	Springs	Semi F		113	34x3½	34x3½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Ball	2,000
Disk	Sel	Amid	3	Bevel	S & T T	Float		118	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,550
Cone	Sel	Amid	3	Bevel	Springs	Semi F	3.75–1	110	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,200
Cone	Sel	Amid	3	Bevel	Tor T	Float	4.00–1	115	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,350
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.75–1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,900
Cone	Sel	Amid	3	Bevel	Springs	Float	3.80–1	120	36x4	36x4			½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,000
Cone	Sel	Amid	3	Bevel	Springs	Float	3.66–1	127	37x4½	37x4½			½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Blal	Roll	Roll	3,500
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		110	34x4	34x4	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Left	Ball, 2	Ball	Ball	Ball	2,750
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		120	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Left	Ball, 2	Ball	Ball	Ball	3,700
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		132	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Left	P&R, 3	Ball	Ball	Ball	4,500
Disk	Sel	Amid	4	Shaft	Rad Rd	Float	2.73–1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	3	Shaft	Rad Rd	Semi F		116	35x4	35x4	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Ball	1,750
Disk	Sel	Unit M	3	Shaft	Rad Rd	Float		128	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,850
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.50–1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,750

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¼ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

at the tables shown on this page it is seen that the left-hand steering and center control has usurped a large part of the field. When such institutions as Packard, Lozier, and Ford factories turn out cars with this form of control it may be taken as final that it has met with the approval of the buyers. In a word it is really the buyer who controls such changes as these. Should he desire another form of control his demands will be heeded by the manufacturers of the country, but up to the present time the converts to the left-hand steer and center control sects are increasing in number. It is seen that the right-hand steer and right control leads the list. The advocates of this form far outnumbering the nearest competitor.

For 1913, 193 are equipped with right-hand steer and right control. Of course it is usually an arduous task inducing the owner of a car with right-hand steer and right-hand control to adopt the newer type, but a great number of former right-side drive makers have back-slid from that class to left-steer division.

Left-Hand Control Advantages

Many of the adherents of right-hand steering employ the center gearshift. The advantages of the new type of control location are many and the advocates of right-steer have just as many arguments to overshadow these. This year but eighty-four chassis are equipped with left-hand steer and center control but when it is remembered that this is an enormous increase over the 1912 figure it seems that that form is taking a firm grip on the buying public. Another form, the right-hand steer with center control is not as much in evidence as the other two types. From all appearances the arguments in favor of this location of control parts are not strong enough to carry over a great number of buyers. Here again reference is made to the fact that the buyer has caused these changes in motor car construction, and it cannot be emphasized too much that it is the buying public that controls such changes.

STEERING WHEEL AND CONTROL LEVER LOCATION ON 1913 CARS

LEFT-HAND STEER

LEFT-HAND CONTROL	CENTER CONTROL — RIGHT-HAND CONTROL	
Krit	A. E. C., 6-45	Lexington
Lion	Alpena	Lozier
Moon	Ames	Luverne
Packard	Amplex	Marion
	Arbenz	Maxwell
	Atlas	Metz
	Austin	Michigan
	Burg	Midland
	Carroll	Mitchell
	Chevrolet	Moon
	Coey	National
	Correja, C. & J.	Norwalk
	Croxton	Paige, 36
	Cunningham	Peerless, 29
	Day Utility	Premier
	Detroiter	R. C. H.
	Duquesne	Reo
	Duryea	Republic, E
	Edwards	Schacht
	Firestone-Columbus	Spaulding
	*Ford	Speedwell
	Garford	Staver
	Gilde, 36-42	Stoddard-Dayton, Knight
	Great Southern	Velie
	Henderson	White
	Herreshoff	
	Holly	
	Inter-State	
	Keeton	
	King	
	Knox	
	Lenox	

RIGHT-HAND STEER

LEFT-HAND CONTROL	RIGHT-HAND CONTROL		
Alpena	Abbott-Detroit	Grout	Pierce-Arrow
Burg, R	Adams-Farwell	Halladay	Pope-Hartford
Cameron, 32	A. E. C., 6-60	Havers	Pratt
Case, N	Alco	Haynes	Pullman
Cino	American	Hudson	Rambler
Coey	Apperson	Hupmobile	Rayfield
Colby	Auburn	Jackson	Reeves
Corbitt	Bergdoll	Kisselkar	Regal
Columbia, 88	Buick	Klinekar	Schlosser
Crow-Elkhart	Cadillac	Lambert	Selden
Davis	Cameron	Little	S. G. V.
Duryea	Carhartt	Locomobile	Simplex
Empire	Carroll	Marathon	Spoerer
Enger	Cartercar	Mason	Staver
Glide, 45	Case, O	Maxwell, 8	Stearns-Knight
Hupmobile, H	Chadwick	Mercer	Stevens-Duryea
Imperial	Chalmers	Miller	Stoddard-Dayton
Knox	Cole	Moline	Studebaker
Marion	Columbia, 85	Moon	Stutz
Matheson	Correja	Morse	Touraine
McFarlan	Crane	Motorette	Triumph
McIntyre	Crawford	Moyer	Velie
Miller	Cutting	Oakland	Warren
Moon	Diamond	Oldsmobile	Westcott
Norwalk	*Dispatch	Omaha	Winton
Nyberg	Dorris	Only	
Overland	Falcar	Pacific	
Perfex	Fiat	Packard	
Pilot	Flanders	Paige, 25	
Pratt, 30	Franklin	Palmer-Singer	
Republic, D	Gleason	Paterson	
Richmond	Great Eagle	Pathfinder	
Zimmerman	Great Western	Peerless	

The Mathematician

Analyzing the Present

WITH $2,150 as purchase money for a motor car the 1914 buyer will get the same car that is listed in the 1913 specifications as a $2,400 vehicle. In 1912 this same car was priced at $2,700. Thus in the following year the purchaser will effect a saving of $250 against the 1913 figure. The person who buys a car in 1914 for $2,150 will pay $350 less than the one who bought that same car in 1911. The price in 1911 for this vehicle was $2,500. The motor car that sold for approximately $954 in 1912 is listed at $920 in the 1913 tables, a drop of $34, but in 1914 the prospective buyer will have a greater outlay for this type of car, for the price will be $1,000, an increase of $80 over the 1913 price. The average car in the $1,500 class will cost but $1,540 in 1914, while at $4,400 the average car in the highest class may be bought. This will be a decrease of 2 per cent against the 1913 price of the same car.

Average Car a Year Hence

Considering all the chassis on the market in 1914 as a whole, the average car will cost $2,200. It will have a six-cylinder motor, with L-head cylinders cast in one block, the bore of the latter will be 4.08 and the stroke 5.29 inches. The motor will develop 30.6 S. A. E. horsepower. The car will have 124-inch wheelbase and will be equipped with an engine starter and electric lights.

Motor Age has been telling in its show numbers each year just what the car of the following year will be—the important mechanical features of the car as well as the price. It must be remembered that the facts given in this issue regarding future cars are to be considered as prophecies and not as tips, for the data given was obtained from figures on file and the predictions made in a systematic way based on the present rate of increase or decline, and not on statements from the makers as to future practice. At this time last year a propheey was made of the 1913 car and in the instances where no abrupt change had taken place during the past year Motor Age's prediction was accurate. For example, in 1912 the prophet told that the wheelbase of the $4,000 car for 1913 would be 130 inches. This is shown to be exactly the average wheelbase of all the 1913 cars in this price classification.

How Future Is Ascertained

It must be remembered that no power on earth can tell what changes the future will see, but by careful calculation it can be shown that at the present rate of progress or decline certain conditions will prevail in later years. The curves shown on these pages were plotted from actual figures on file. The average figures for the bore, stroke, horsepower, etc., of the 1910 car are at hand as are those of the 1911 and 1912 average cars in each class. All that remains is to represent these figures graphically and the use of cross-section paper makes this a simple matter. The vertical lines are made to represent the different years, while the horizontal lines show the various car characteristics. Take the horsepower curve of the $4,000 class as an example. The average horsepower of this class was 46.5 in 1910. A point is marked on the line representing 1910, at a height representing 46.5. In 1911 the average horsepower of this class was 45.0. This figure is looked for on the horizontal lines and a point made at the intersection of this line with the vertical line representing 1911. The same thing is done with the 1912 and 1913 figure. The points on the plotting or cross section paper are four in number, one at a point on the 1910 line, another on the 1911 and another on the 1912 and 1913. These points may or may not lie in a straight line, but if connected the line resulting will show the tendencies for the 4 years represented. There is no abrupt change in any form of enterprise, so there will be no angles in any of these diagrams, but a curved line will result. The figures for 4 years being in the form

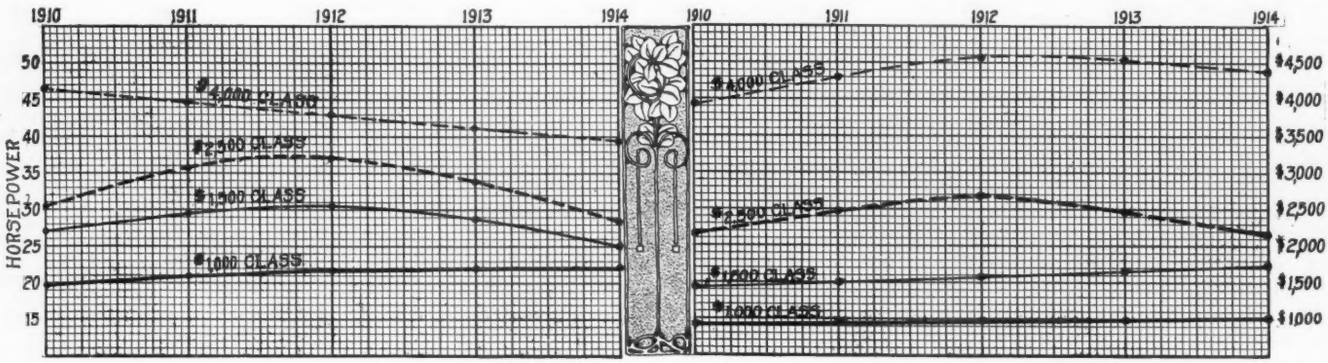


FIG. 1—LOW AVERAGE HORSEPOWER EXPECTED FOR 1914 AS INDICATED BY TREND IN PAST

FIG. 2—AVERAGE PRICES OF CARS FOR PAST 3 YEARS AND FOR NEXT YEAR

and the Motor Cars

What of the Future?

of a curve, any prolongation of the curve will show the tendencies for the future. Where the curve crosses the line representing 1914 it means that at the former rate of increase or decline the figure represented by the point of intersection will be the approximate average horsepower in 1914. In the case of the horsepower curve the prolonged line intersects the 1914 line at 39.0, which means that should the horsepower continue to decrease as it has, in 1914 the average car of the $4,000 class will have 39.0 horsepower. All the curves have been plotted with the fundamental idea that the present rate of advance or drop will continue until 1914.

Power of 1914 Car

The horsepower curves in Fig. 1 show at a glance that the average horsepower in three instances is decreasing and only in the case of cars in the $1,000 class is the horsepower tending to go higher. The curves of the $2,500 and $1,500 classes are working towards each other and it would be fair to say that in 1916 there will be no distinction in these classes as to horsepower, for this will be the same in both classes. Then, too, at a point between 1914 and 1915 the horsepower of the $1,000 cars will be equal to that of the $1,500 and $2,500 cars. As the curve shows, it will be some time before the cars of the $4,000 class have the same horsepower as the cars of the other classes. In 1914 all cars considered, the average horsepower will be 30.6. In 1914 cars of the $1,000 class will show an average of 22.0 horsepower, those of the $1,500 class will average 25.0 horsepower, while 28.0 will be the average S. A. E. horsepower of cars of the $2,500 class. The decided drop in the horsepower of cars in the $4,000 class is evidenced, by the fact that in 1914 the average horsepower in this class will be 39.0. The reason for this drop in the horsepower is made clear when these things are considered: Manufacturers are tending to discard the four-cylinder car and build sixes, and if four-cylinder cars are continued the stroke is increased. The S. A. E. horsepower is based upon the cylinder bore, and since in the manufacture of six-cylinder motors the bore is decreased the horsepower rating decreases accordingly. However, the number of cylinders has been increased, but in very few cases in the same proportion as the bore has decreased. The bore has dropped at a rate out of proportion to the increase in the number of cylinders, but the stroke has been increased considerably. American manufacturers are siding with those abroad with respect to long stroke motors, for foreign practice in the past has been in favor of this type.

Predicting the Bore

The bore and stroke curves shown in Figs. 5 and 6 show at a glance that the bore is gradually decreasing and the stroke increasing. Manufacturers believe in the long-stroke motor. The ensuing year will bring the bore of the motors in the $1,000 class to 3.57 inches and in the $1,500 class a proportionate drop will be noticed; the bore in this case will be 3.97 inches. In 1914, motors in use in the cars of the $2,500 class will show an average bore of 4.07 inches, while the $4,000 motors will show the low average bore of 4.60 inches, as shown by the curve in Fig. 5. However, the average car will have a bore of 4.08 inches, in 1915 this figure will be decreased to 3.69 inches, and in 1916 the average American motor car will have a bore of 3.84. That is at the present rate of decrease the average car will have these different bores in each succeeding year. The stroke has been increasing and will continue to increase steadily.

Next year, according to the curve in Fig. 6, will see the average car of the $1,000 class with a stroke of 4.37 inches, with the $1,500 class some distance away with 5.28 inches as the average bore. The figure for the cars in the $2,500 class will be close to that of the preceding one, and the average in this class, from all appearances will be 5.32 inches. In the $4,000

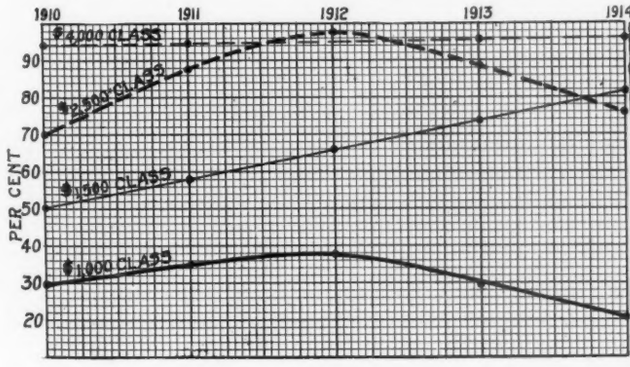


FIG. 3—PREDICTION FOR 1914 AS REGARDS PUMP WATER CIRCULATION

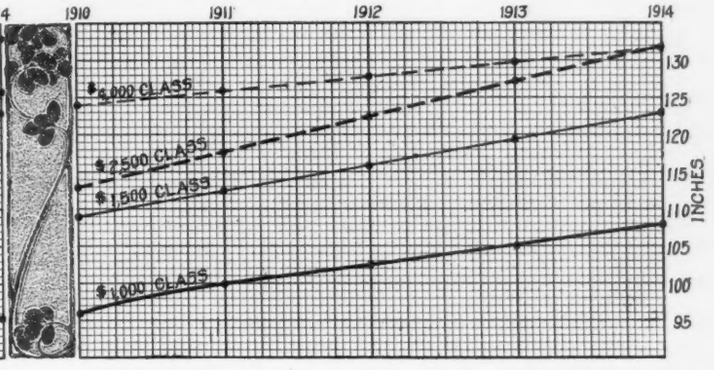


FIG. 4—INCREASE IN WHEELBASE OF AVERAGE CAR AND PROPHECY FOR 1914

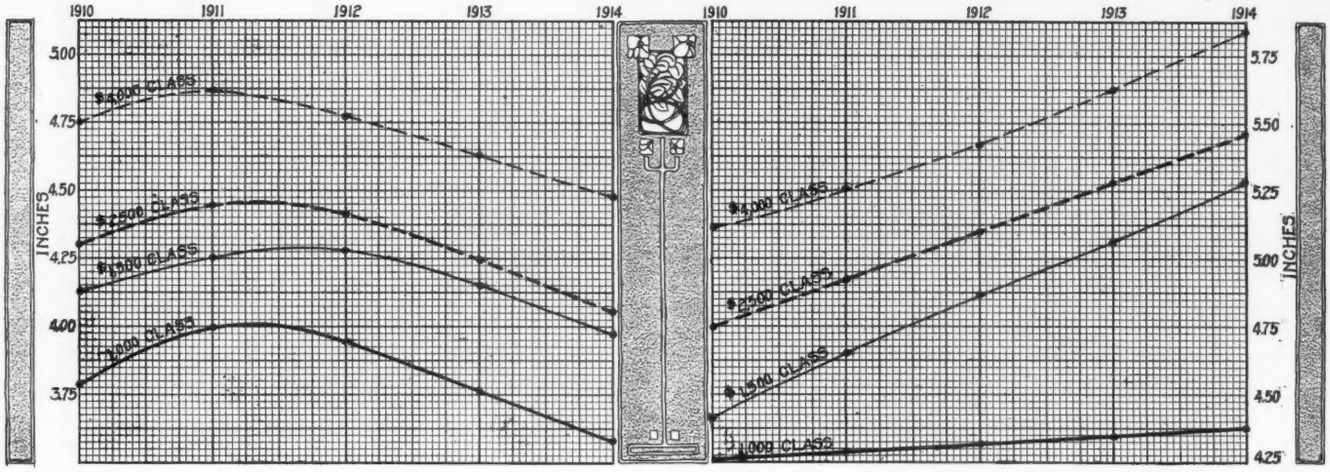


FIG. 5—SHOWING GRADUAL DROP IN AVERAGE BORE SINCE 1911 AND 1914 PROPHECY

FIG. 6—THE TREMENDOUS RISE IN THE AVERAGE STROKE OF THE FOUR CLASSES

class, 5.81 inches will be the average for the stroke.

By careful figuring it is shown that the 1914 motor will have a stroke of 5.29 inches. The stroke in 1915 will soar to 5.46 inches, and in 1916 the stroke for the average motor will reach the high mark of 5.62 inches. It must be remembered that the average car means all chassis taken as a whole and not by classes. Of course this rate cannot increase forever, but at some time or other the bore and stroke curves will straighten out and remain constant for a long period until some radical changes are made in motor design.

1914 Motor to Have Long Stroke

The bore and stroke curves tell us that the bore is on the decline and that in 1914 the average bore will be 4.08 inches and the stroke 5.29 inches. The average stroke is rising out of proportion to the fall in the bore, and since the displacement is dependent upon bore and stroke and number of cylinders it is quite plain that the piston displacement will increase. At the same time the horsepower is decreasing. The S. A. E. formula for horsepower does not take into consideration the stroke of the motor. The bore is decreasing, hence the rated horsepower drops, but the tremendous increase in the stroke brings the piston displacement much higher than in former years. The rise in the number of six-cylinder motors tends to bring the displacement figure higher. The average piston displacement in 1912 was 316.2 cubic inches. The coming year will see this figure rise to 345.0 cubic inches, and in 1914, at the same rate of increase, which is 12 per cent per year, the average piston displacement of American motors will be about 420.0 cubic inches. A great number of people do not judge motors by their S. A. E. horsepower, but instead consider piston displacement, and if this be the case the future motor will be more powerful than they are at the present, but one rated at less horsepower by the S. A. E. formula.

In the $2,500 car for next year the percentage of T-head motors will advance to 48 per cent of the total number of chassis to be built. The drop to 39 per cent in $4,000 will be nothing unusual, for this class has been showing a tendency to drop for the past three years.

Mostly Six-Cylinders Next Year

What will be the distribution of six-cylinder cars among the four classes? A study of Fig. 7 wil result in the conclusion that the percentage of six-cylinder cars in 1914 will be greater than in any of the preceding years. The greatest advance in the manufacture of sixes will be made by the manufacturers of cars in the $2,500 class. The curve of this class shows that 94 per cent of the number of cars to be manufactured that will cost between $2,000 and $3,000 will have six cylinders. On the other hand, only 70 per cent of the higher-priced motors will be of the six-cylinder type. The $1,000 and $1,500 classes will contain a greater number of sixes than they did heretofore, but only a fraction of the number in the other classes. The reason for this advance is a simple one. Everyone wants a six. The four-cylinder motor has a fight when a six is available at the same price. It has been shown in this issue that the intermediate classes, the $1,500 and $2,500, have gained a greater number of manufacturers than either of the other classes. In fact, the other classes have lost in the number of makers represented. Now since all the factories are tending to build cars for the $2,500 and $1,500 classes there is greater competition in these divisions than in the others, and the competition forces the manufacturers of the $2,500 and $1,500 classes to make sixes in order to sell. The $4,000 class, consisting mainly of old established firms with conventional designs set down years ago and still adhered to, retains the four-cylinder motor. There has been an increase in this class due to the casting aside of four-cylinder practice. The Packard is a clear case wherein the four has been scrapped and the six become dominant.

That pump circulation of water is on the decline in the $1,000 class and also in the $2,500 class is shown by the curves in Fig. 3. The other two classes, on the other hand, show a gradual tendency to increase the percentage of cars with pump circulation. We see then that in 1914 76 per cent of the cars in the $2,500 class will have pump circulation of water, while in the $1,000 class only 20 per cent of the motors will be equipped with water pumps. The remaining portion in each class will be either thermo-syphon or air-cooled. The $4,000 curve does not show a great increase within the past 3 years. To be exact, the rise from 1910 to 1913 is only 2 per cent. In 1914 96 per cent of cars costing more than $3,000 will have pump circulation of water. In the remaining class, the $1,500, 82 per cent will use water pumps in 1914. This will be an increase of 8 per cent over the 1913 figure.

How Motors Will be Cooled

Merely the fact that a certain class is increasing in the percentage of water pumps used is no reason for the thermo-syphon or even the air-cooled motors not being as efficient. The rise of pump circulation in the $1,500 class is due to the fact that that class has been receiving those who evacuated the $1,000 class and $4,000 classes, and these in turn have brought with them the designs they used in manufacturing their former products. It is clear then that should manufacturers using pump circulation leave the $1,000 and migrate to the $1,500 class it will cause a decrease in the cars using pump circulation in the $1,000 class and a proportionate increase in the $1,500 class. The $2,500 class is next to be considered. As has been mentioned before, this class has received many manufacturers who formerly built for the other classes. The competition being great and the public's demand for sixes fully equipped with starters, etc., makes the $2,500 car manufacturer look for a place to cut down costs. A water pump costs money and since the thermo-syphon system has its advantages and is considered by many engineers just as efficient as the pump circulation, the thermo-syphon system of engine cooling is adopted.

The curve of the $4,000 class does not show very much of an increase for 1914 in the use of water pumps, because very few of the makers of this class change their fundamental principles of design. They began with water pumps and will continue to use them in 1914. The rise in the percentage for 1914 will be caused by the drop in the number of $4,000 manufacturers. As has been shown, this class is gradually losing its membership and all indications point toward a still greater loss. A number of those makers who have fled from the high grade field were those who leaned toward thermo-syphon cooling. This, of course, will cause the percentage of motors with pump circulation to increase and keep increasing in this class. It may be said, then, with fair accuracy that about 65 per cent of the cars to be manufactured for 1914 will have pump circulation of water.

That the wheelbase of the average car will be greater in 1914 than in 1913 is evidenced by the fact that all the curves shown in Fig. 4, are rising in almost the same proportion. Here again it is shown that there will be no distinction between the $2,500 and $4,000 classes in 1914. The curves tell us that the wheelbase of cars in these classes will be the same. In 1914 the car selling from $2,000 to $3,000 will have a 132-inch wheelbase, the higher priced car will have the same wheelbase, while that of the car costing under $1,250 will be 108 inches. The cars in the $1,500 class will have their wheelbase increased accordingly, and at the present rate of increase the average car of this class will have a 126-inch wheelbase.

Increase of Wheelbase Expected

With the coming of the six and adoption of sixes instead of fours plus the number of new manufacturers of six-cylinder cars, it is quite evident that an increase in wheelbase will be necessary in the 1914 products. The long hood of the six cylinder car makes it necessary to have the wheelbase longer so that the car will not look out of proportion. The curves in Fig. 7 show that in 1914 more six-cylinder motors will be manufactured than fours. The making of a six is always accompanied by an increase in the wheelbase, which bears out the curves shown in Fig. 4. In all the chassis taken together, the average wheelbase will be 124 inches, which will be 3 inches greater than that of 1912 and 2 inches greater than the 1913 average wheelbase.

Motor Types in 1914

A year from now will see the two intermediate classes high above the other two as regards the percentage of T-head motors employed. In 1914 2 per cent of the cars in the $1,000 class will have T-head motors. The curve in Fig. 8, representing the $1,500 cars, shows that the ensuing year will see T-head type of cylinder. The $4,000 class is declining in this respect and the 1914 percentage of T-head motors in this class will be 39. Trying to cheapen the cost of construction is given as the main cause of this. However, this drop in the cost will cause a proportionate drop in the price of the $4,000 cars, as the price curve of this class shows. The purchaser then will be given the benefit of the cheaper form of construction. The drop in the percentage of T-head motors in the $1,000 will be due to the fact that the manufacturer cannot afford to sell a T-head motor with its two camshafts and other necessary parts, for the same price that the L-head maker can sell his product. The latter type of motor has its advantages and there is no reason why the makers of the cheaper grade of cars should not adopt the L-head type. The fight between the car manufacturers in the intermediate classes, coupled with the fact that these classes have received makers of the other classes with stable designs that they will not alter, will cause the rise in the percentage of T-head motor in these classes. The percentage of T-head motors manufactured by the high-grade makers will be equal to the number turned out by the factories producing the $1,500 cars, in 1916. The tendency on the part of the $2,500 curve is to rise steadily in the same proportion that the $1,000 curve drops. It is evident then that these two will never meet unless some radical change is made in motor car design that will cause an abrupt turn in both these curves. No one can foretell what designs the future will bring so it remains to prophesy these figures based on the present rate of rise or fall.

It may be said with safety that while the wire wheel is admired by only five makers of motor cars this year 1914 and the two succeeding years will see that number doubled and redoubled. An advance of 400 per cent in this type of wheel has been noted since 1912 and it seems likely to grow so rapidly in popularity with the motor car buyer that the wire wheel will be demanded as regular equipment.

Tendency toward a low narrow frame has been increasing and the year 1916 will see the majority of cars manufactured with the frame so narrow and low that the pulling and hauling at present necessary to turn around in the city streets will be an unusual sight. The greater number of cars will be able to turn completely around in the ordinary 40-foot street, a thing that may be accomplished now only by a small number of cars. Lowering the center of gravity by dropping the frame will in future years reach its maximum point with the making of the underslung frame. This point is some distance off but the advance is rapid.

Return of Single Ignition

With the advent of the combined lighting, ignition and starting system it seems quite possible that the future will see the return of the almost abandoned single system. The generator taking the place of the magneto makes that instrument unnecessary, the source of current being the battery, which is continually charged by the generator. It is thought by some that foreign practice will also effect the rejuvenation of the single system. Abroad the dual system is looked upon as ridiculous, the owner saying that the car starts on the magneto with a turn of the crank and therefore does not see the necessity of a storage battery, which is an added expenditure to the initial cost and requires attention. It may be said that the single ignition will once more return to its former good standing in 1916, for at that time it is expected that the majority of cars manufactured will be equipped at the factory with a generator system for lighting, ignition and starting.

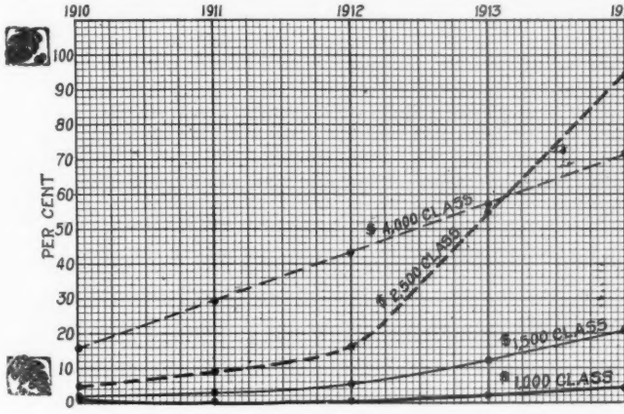


FIG. 7—PERCENTAGE OF SIX-CYLINDER MOTORS AND A PREDICTION FOR 1914

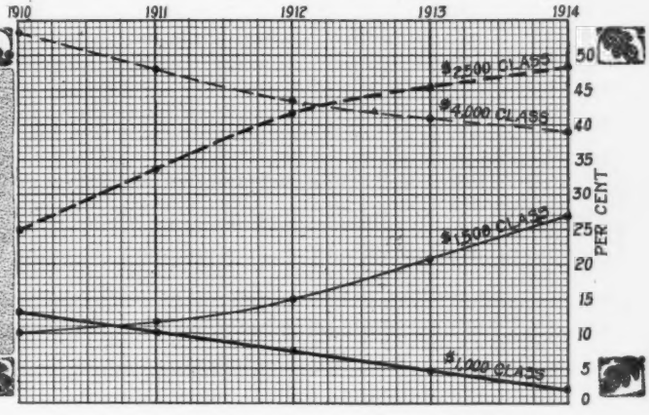
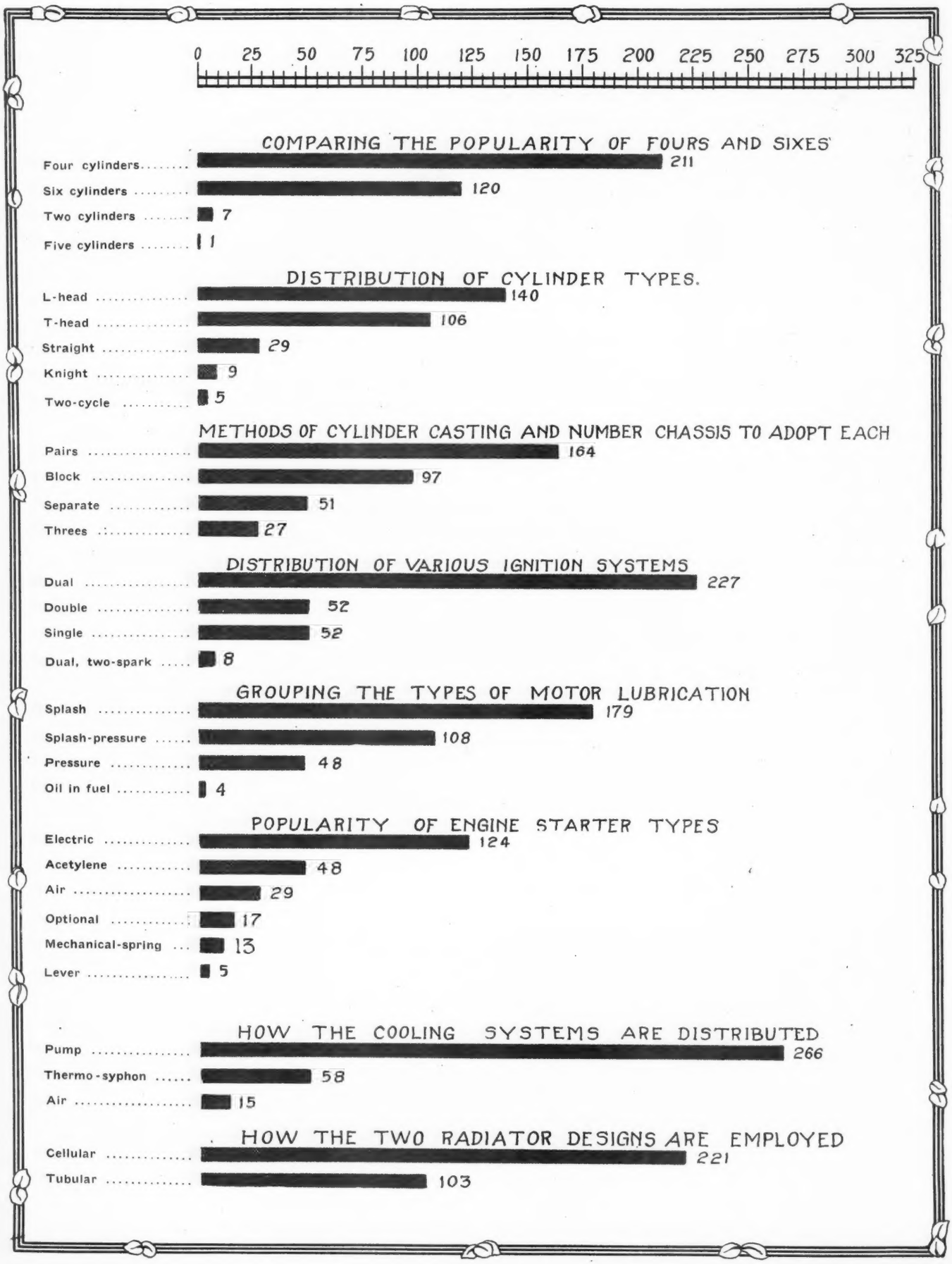
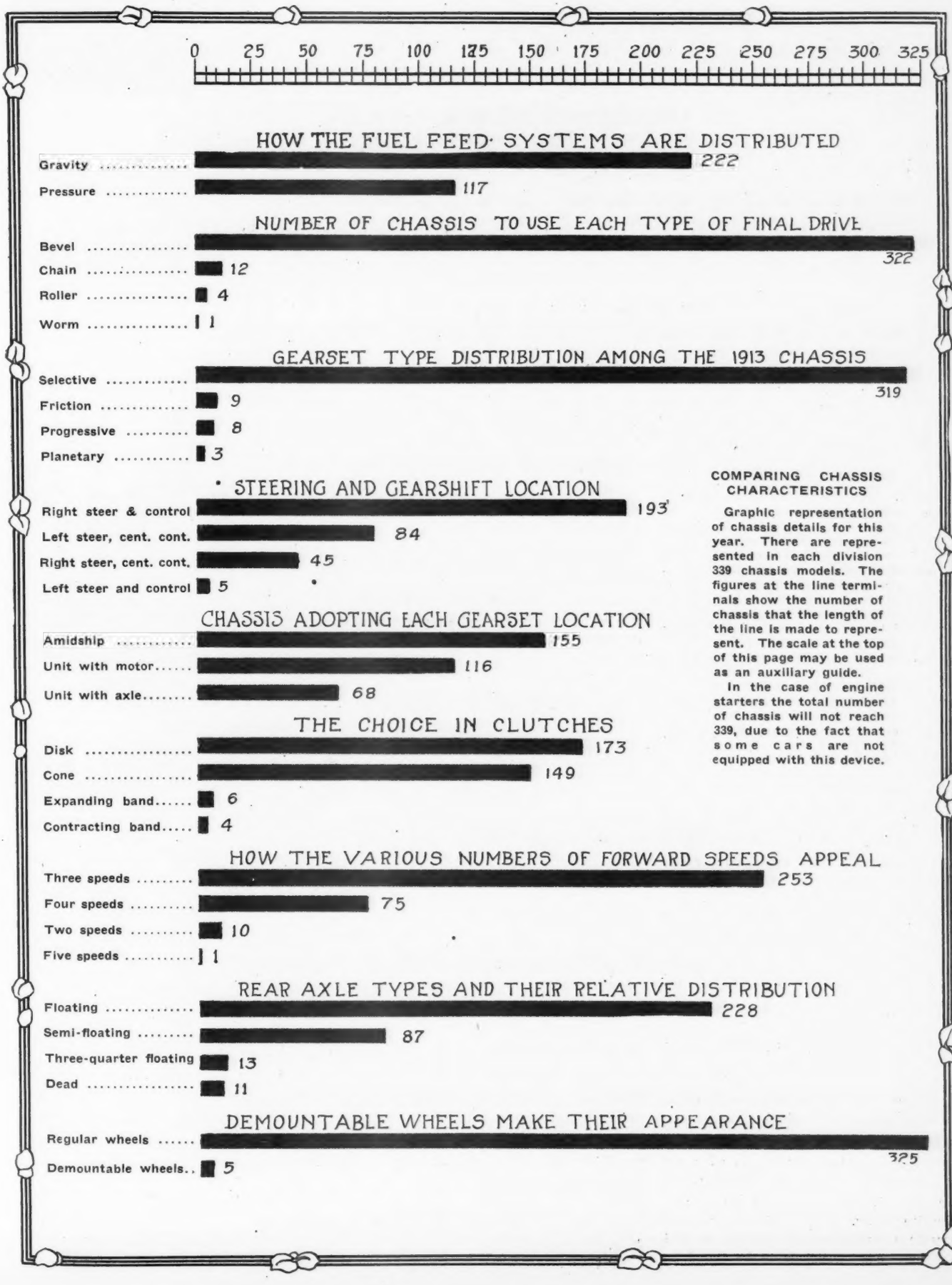


FIG. 8—PERCENTAGE OF T-HEAD MOTORS FOR 4 YEARS SHOWN GRAPHICALLY AND 1914 OUTCOME

Chart Showing General Tendencies of American Cars



Offered to Motor Buyers for the Season of 1913



COMPARING CHASSIS CHARACTERISTICS

Graphic representation of chassis details for this year. There are represented in each division 339 chassis models. The figures at the line terminals show the number of chassis that the length of the line is made to represent. The scale at the top of this page may be used as an auxiliary guide.

In the case of engine starters the total number of chassis will not reach 339, due to the fact that some cars are not equipped with this device.

THE scope embraced in the body designs and car equipment offered this year is so broad that none but a brief description of the 1913 bodies may be given here. The buyers' guide, shown on this and the following pages, is a study in itself, in so far as body variations are concerned. There was a time when a limousine could not be selected from any but the $4,000 class, but now the buyers' guide has a limousine listed at $1,600. The $1,000 class offers all body styles except the limousine.

The coupe, a body entirely inclosed and seating from two to four persons, has found its way to the $1,000 class, the Hupmobile, Marathon and Studebaker coupes being examples of these. No distinction is made between the coupe body and the brougham, for the former is the French, while the latter the English term for the same body. Originally the body was named after Lord Brougham, who constantly used an enclosed body of horse-drawn rig with a seating capacity for two. The French word, coupe, means the same thing, and the reason that some makers use brougham and others coupe is because of the fact that some believe an air of distinction follows the French, while others are of the opinion that the English name is more attractive because of the origin of the brougham. In the brougham or coupe all the occupants are in the same inclosure. The sedan is a coined name for coupe.

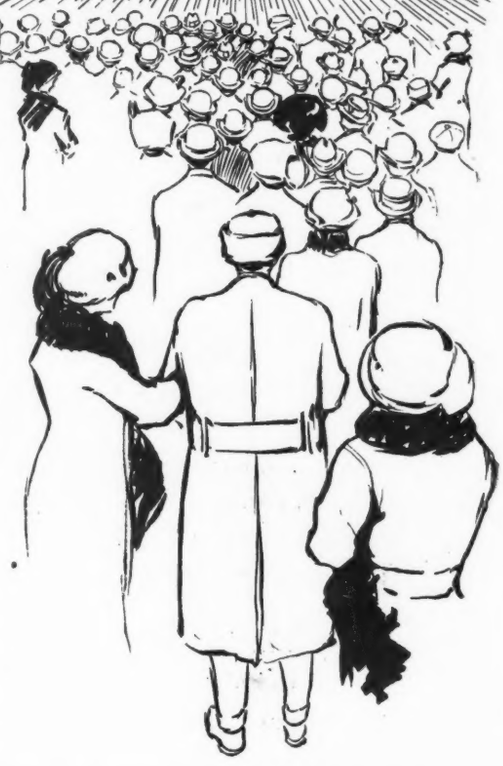
The Reo limousine, listed in the $1,500 class, sells for $1,600, and is a good example of the modern limousine, having an enclosed body with a roof over the driver. Ford's town car, listed in the $1,000 division at $800, on the other hand, is distinctively a landaulet. This body is one that is convertible, part of it being made of leather; it is readily folded and made to resemble an open car. The Ford town car is a six-passenger car, something unusual to be found in the $1,000 class.

Berlin a German Body

The berlin or berline body, to be found only on cars in the $2,500 and $4,000 classes, is a derivative of that seen in the days of primitive Berlin. This German body had a separate compartment for the driver and this same arrangement is to be found on the berline bodies of today, in contrast to the single compartment of the brougham and coupe. Some manufacturers make a distinction between the different types of inclosed cars, which is not in conformity with the rules and definitions set down by the body designers. The Packard imperial limousine is an example of the brougham type of inclosed body. This renaming of bodies is practiced very often and, as has been shown, is merely a method of impressing a certain type of body style on the mind of the purchaser.

Some Open Car Types

The demi-tonneau, close-coupled touring and toy tonneau are essentially the same. In such cases the wheelbase of the ordinary touring car is shortened with a proportionate decrease in the length of the tonneau. The forward part is exactly like the touring body. Closely related to the touring body and its various contemporaries is the phaeton. The distinguishing feature of this body



Buyers' Guide Scope of Each

$1,000 CLASS
COMPLETE CARS COSTING UNDER $1,250

$1,500 CLASS
COMPLETE CARS COSTING FROM $1,250 TO $1,999

No distinction is made between the words generator and dynamo used in the column under lighting systems. Some manufacturers call their system a dynamo system while others use the word generator, but in reality they are the same—an electric generator. In some instances information regarding the lighting system is omitted. This may be due to the fact that the maker is undecided as to what system to install or that no lighting system is given as regular equipment. To distinguish from a generator system for lighting the word battery is used

$1,000 CLASS

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES		ELECTRIC LIGHT SYSTEM	FEATURES
						Front	Rear		
Auburn, 33L	Road	$1,150	2	22.50	112	34x3½	34x3½	Ward-Leonard	
Auburn, 33L	Tour	1,150	5	22.50	112	34x3½	34x3½	Ward-Leonard	
Buick, 24	Road	950	2	22.50	105	32x3½	32x3½		Acet Starter
Buick, 25	Tour	1,050	5	22.50	105	32x3½	32x3½		Acet Starter
Buick, 30	Road	1,125	2	25.60	108	34x4	34x4	Vesta Battery	Acet Starter
Cameron, 28	Tour	800	4	24.00	104	32x3	32x3		Air Cooled
Cameron, 29A	Tour	950	5	24.00	110	32x3½	32x3½		Air Cooled
Cameron, 30	Flyer	1,200	2	36.07	114	34x3½	34x3½		Air Cooled
Crow-Elkhart, C-1	Road		2	22.50	112	32x3½	32x3½		Acet Starter
Crow-Elkhart, C-2	Tour		5	25.60	114	34x3½	34x3½		Acet Starter
Detroiter, A-3	Road	900	2	18.25	104	32x3½	32x3½		
Detroiter, A-4	Road	900	2	18.25	104	32x3½	32x3½	Exide Battery	
Detroiter, A	Tour	850	5	18.25	104	32x3½	32x3½		
Detroiter, A-1	Tour	900	5	18.25	104	32x3½	32x3½		
Detroiter, A-2	Tour	900	5	18.25	104	32x3½	32x3½	Exide Battery	
Duryea, F, P	Run	625	2		80	30x3	36x3		Two-Cycle
Duryea, F, P	Buggy	487	2		80	1¼	1¼	Battery	Two-Cycle

is the short, narrow and low tonneau. The wheelbase of the chassis is not shortened in the case of the phaeton. In every instance the body is made narrower than the touring body, but it is not often possible to get a low suspension.

Surrey and Victoria Bodies

Duryea is the only manufacturer who adheres to the surrey. The original surrey was made in Surrey, England, and was a light, two-seated carriage with seating capacity for four persons. The Duryea surrey is almost an exact reproduction of the obsolete surrey. The victoria body, which gets its name from the fact that Queen Victoria of England first used it, is a body seating two with the driver's seat elevated and forward of the passengers' seat. The Duryea victoria differs from the original in that the driver's seat is eliminated, making it a two-passenger body, the driver taking the place of one of the passengers.

The detachable tonneau, brought to the $1,000 class this year only by the Luck Utility, is a unique arrangement and is welcomed by the man who wishes to use his car for business as well as pleasure. The tonneau, or that part of the body in which the rear passengers sit is removable in a short time to permit of the use of a delivery body.

The inclosed cars are equipped with such refinements as step lights, this in many instances being the light from the side lamps reflected by means of a mirror. In the case of the Locomobile the light is under the frame and is turned on automatically when the door is opened. The ignition batteries and the tool boxes are in most cases placed under the step so that they will not interfere in any way with passengers alighting from the car.

Dash Fuel Tanks Coming In

The dash fuel tank is becoming popular, this giving the car a better appearance and making tank filling easier. In the case of the Moline and others the filler cap is on the dash, so that the driver need not move from his seat to fill the tank. The dash or cowl tank in this case is used as an auxiliary tank, while the main reservoir is under the front seat. It is not necessary to fill from the auxiliary tank in the cowl.

As will be noted after studying the buyer's guide, the horsepower of the motors is considerably less in some instances than that given last year. The increase in the length of the stroke and the decrease in the bore has brought about this state of affairs. The S. A. E. horsepower is calculated from a formula that does not take the stroke directly into consideration. In the formula $D^2N \div 2.5$, the denominator is intended to include the stroke, the speed, the mean effective pressure and a number of other factors. However, the prospective purchaser is already aware of the fact that a long-stroke motor generally is considered the most desirable and will find that the manufacturer also is of this opinion.

Makers are offering for this year a car of much longer wheelbase than was given in 1912, and although this rise in the wheelbase has not been abrupt in any particular case, an average rise of 2 inches

Price Classification Buyers' Guide

$2,500 CLASS
COMPLETE CARS COSTING FROM $2,000 TO $2,999

$4,000 CLASS
COMPLETE CARS COSTING $3,000 OR OVER

In most instances a car has a number of special features but lack of room did not permit of the use of all. In such cases the most notable feature was selected. For example, a six-cylinder motor in the $1,500 class is something that would not ordinarily be looked for. The car may have a starter and electric lighting, but it was deemed advisable to use the most attractive feature—the six-cylinder motor. Of course this would not be the case with a car of the $2,500 or $4,000 class, for it is expected that the majority of cars in these price classifications have six-cylinder motors

$1,000 CLASS,—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E H. P.	WHEEL-BASE	TIRES		ELECTRIC LIGHT SYSTEM	FEATURES
						Front	Rear		
Duryea, F, P	Surey	537	4		90	1¾	1½	Battery	Two-Cycle
Duryea, F, P	Vict	625	2		100	1¾	1½	Battery	Two-Cycle
Empire, 25	Tour	950	5	19.60	104	32x3½	32x3½		Center Control
Ford, T	Tour	600	5	22.50	100	30x3	30x3½		Left-hand Steer
Ford, T	Run	525	2	22.50	100	30x3	30x3½		Left-hand Steer
Ford, T	Town Car.	800	6	22.50	100	30x3	30x3½		Left-hand Steer
Gleason, R	Run	850	2	18.00	96	36x2	36x2		
Gleason, R	Run	875	3	18.00	96	36x2	36x2		
Gleason, R	Tour	1,000	5	18.00	96	36x2	36x2		
Halladay, 32	Road	1,200	2	22.50	112	33x4	33x4	Deaco	Elec Starter
Halladay, 32	Tour	1,200	5	22.50	112	33x4	33x4	Deaco	Elec Starter
Hupmobile, C	Run	750	2	16.90	86	30x3	30x3		
Hupmobile, E	Road	850	2	16.90	110	30x3	30x3		
Hupmobile, H	Road	975	2	16.90	106	32x3½	32x3½		Dash Primer
Hupmobile, H	Tour	975	4	16.90	106	32x3½	32x3½		Dash Primer
Hupmobile, C	Coupe	1,100	3	16.90	86	30x3	30x3	Battery	

BUYERS' GUIDE—$1,000 CLASS—Continued

NAME AND MODEL	BODY	PRICE	EATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Hupmobile, E	Coupe	$1,150	3	16.90	110	30x3	31x3½	Battery	
King	Road	1,190	2	22.50	110	32x3½	32x3½		
Krit, K	Road	900	2	22.50	106	32x3½	32x3½	Optional	Left-hand Steer.
Krit, K	Tour	900	5	22.50	106	32x3½	32x3½	Optional	Left-hand Steer.
Lambert, 40	Tour	1,130	5	16.90	112	32x3½	32x3½		Friction Drive
Little Four	Run	690	2	19.60	90	30x3½	30x3½		
Lion, 30	Road	890	2	19.60	110	32x3½	32x3½	Battery	Left-hand Steer.
Luck, Utility	Det. Ton		5		115	36x3½	36x3½		
Marathon, Runner	Road	875	2	19.60	104	32x3½	32x3½		
Marathon, Runner	Tour	950	5	19.60	104	32x3½	32x3½		
Marathon, Runner	Coupe	1,050	2	19.60	104	32x3½	32x3½		
Mason, A	Tour		4	20.00	96	32x3½	32x3½		Two-Cylinder
Mason, C	Tour		5	20.00	96	32x3½	32x3½		Two-Cylinder
Maxwell, 4	Road	785	2	22.50	93	30x3½	30x3½		Acet Starter
Maxwell, 8	Road	1,110	2	25.60	106	32x3½	32x3½		Acet Starter
Maxwell, 8	Tour	1,145	5	25.60	106	32x3½	32x3½		Acet Starter
Metz	Run	495	2	22.50	90	30x3	30x3		Left-hand Steer
Motorette, M	Run	350	2	11.25	74	28x2½	28x3		Three Wheels
Oakland, 35	Road	1,000	3	19.60	112	32x3½	32x3½	Deaco	Deaco Ignition
Oakland, 35	Tour	1,075	5	19.60	112	32x3½	32x3½	Deaco	Deaco Ignition
Only, A	Run	1,000	2	28.90	112	32x3½	32x3½		Long Stroke
Overland, 69	Road	985	2	25.60	110	32x3½	32x3½		Acet Starter
Overland, 69	Tour	985	5	25.60	110	32x3½	32x3½		Acet Starter
Overland, 69	Tour	1,010	4	25.60	110	32x3½	32x3½		Acet Starter
Paige, 25	Road	950	2	22.50	110	32x3½	32x3½		
Paige, 25	Tour	950	5	22.50	110	32x3½	32x3½		
Perfex, 2	Road	1,050	2	22.50	106	32x3½	32x3½	Battery	Center Control
R. C. H.	Road	900	2	16.90	110	32x3½	32x3½	Battery	Left-hand Steer.
R. C. H.	Tour	900	5	16.90	110	32x3½	32x3½	Battery	Left-hand Steer.
Regal, N	Road	900	2	22.50	108	32x3½	32x3½	Battery	Underslung
Regal, T	Tour	950	4	22.50	108	32x3½	32x3½	Battery	Underslung
Reo, The Fifth	Road	1,095	4	25.60	112	34x4	34x4	Battery	Acet Starter
Richmond, O	Road	1,100	2	25.60	112	34x3½	34x3½		Starter
Richmond, O	Tour	1,200	5	25.60	112	34x3½	34x3½		Starter
Studebaker, 20	Road	750	2	20.30	102	30x3	30x3½		
Studebaker, 20	Suburban	800	4	20.50	102	30x3	30x3		
Studebaker, 20	Coupe	1,050	2	20.50	102	30x3	30x3		
Studebaker, 20	Tour	800	4	20.50	102	32x3	32x3		
Studebaker, 25	Road	875	2	19.60	101	30x3½	30x3½		Acet Starter
Studebaker, 25	Tour	885	5	19.60	101	30x3½	30x3½		Acet Starter
Studebaker, 30	Road	1,100	2	25.60	112	32x3½	32x3½		
Studebaker, 30	Dem.-Ton	1,100	4	25.60	112	32x3½	32x3½		
Studebaker, 30	Tour	1,100	5	25.60	112	32x3½	32x3½		

$1,500 CLASS

Abbott-Detroit, E	Demi-Ton	$1,975	4	32.40	121	36x4½	36x4½	Autolite	Elec Starter
Abbott-Detroit, D	Road	1,700	2	27.30	116	34x4	34x4	Autolite	Elec Starter
Alpena, P-40	Road	1,750	2	22.50	135	36x4	36x4	Electro	Elec Starter
Alpena, P-40	Tour	1,800	4	22.50	135	36x4	36x4	Electro	Elec Starter
Alpena, P-40	Tour	1,800	5	22.50	135	36x4	36x4	Electro	Elec Starter
Alpena, P-40	Tour	1,890	6	22.50	135	36x4	36x4	Electro	Elec Starter
Alpena, P-40	Tour	1,890	7	22.50	135	36x4	36x4	Electro	Elec Starter
American, Scout, 22A	Road	1,475	2	22.50	105	36x3½	36x3½	Battery	Underslung
Ames, 44	Road	1,595	2	27.30	118	36x4	36x4	Dynamo	Acet Starter
Ames, 45	Tour	1,635	5	27.30	118	36x4	36x4	Dynamo	Acet Starter
Apperson, 4-45	Road	1,600	2	32.40	114	34x4	34x4	Battery	Elec Starter
Apperson, 4-45	Tour	1,600	5	32.40	114	34x4	34x4	Battery	Elec Starter
Arbenz, F	Tour	1,875	5	27.30	120	36x4	36x4	Battery	Elec Starter
Arbenz, G	Torpedo	1,875	4	27.30	120	36x4	36x4	Battery	Elec Starter
Arbenz, H	Road	1,825	2	27.30	120	36x4	36x4	Battery	Elec Starter
Auburn, 37L	Tour	1,400	5	28.90	115	35x4	35x4	Ward-Leonard	
Auburn, 40L	Road	1,650	2	32.40	122	36x4	36x4	Ward-Leonard	
Auburn, 40L	Tour	1,650	5	32.40	122	36x4	36x4	Ward-Leonard	
Bergdoll, C-30	Road	1,600	2	25.60	115	34x4	34x4	U. S. L.	Elec Starter
Bergdoll, C-30	Tour	1,600	5	25.60	115	34x4	34x4	U. S. L.	Elec Starter
Bergdoll, C-30	Fore Door	1,600	4	25.60	115	34x4	34x4	U. S. L.	Elec Starter
Bergdoll, C-30	Torpedo	1,600	4	25.60	115	34x4	34x4	U. S. L.	Elec Starter
Bergdoll, D-40	Road	1,800	2	25.60	115	34x4	34x4	Westinghouse	Elec Starter
Bergdoll, D-40	Torpedo	1,800	4	25.60	115	34x4	34x4	Westinghouse	Elec Starter
Bergdoll, D-40	Tour	1,800	5	25.60	115	34x4	34x4	Westinghouse	Elec Starter
Buick, 31	Fore Door	1,285	5	25.60	108	34x4	34x4	Vesta Battery	Acet Starter
Buick, 40	Tour	1,650	5	28.90	115	36x4	36x4	Vesta Battery	Acet Starter
Burg, S	Run	1,975	3	33.75	134	36x4	36x4		Center Control
Burg, S	Tour	1,975	5	33.75	134	36x4	36x4		Center Control
Cadillac, 1913	Road	1,975	2	32.40	120	36x4½	36x4½	Delco	Elec Starter
Cadillac, 1913	Torpedo	1,975	4	32.40	120	36x4½	36x4½	Delco	Elec Starter
Cadillac, 1913	Phaeton	1,975	4	32.40	120	36x4½	36x4½	Delco	Elec Starter
Cadillac, 1913	Tour	1,975	5	32.40	120	36x4½	36x4½	Delco	Elec Starter
Cameron, 32	Tour	1,450	5	36.07	120	34x3½	34x3½		Air Cooled

means much. The wheel diameter in the different classes has remained stationary, but the width across the tire has increased in a great number of cases. The added weight due to the addition of starting and lighting outfits made it necessary to increase the tire size in this respect. This year is a big six-cylinder year, some manufacturers even going so far as to discontinue fours entirely. The Packard no longer makes the 18 and 30-horsepower cars, but confines its efforts to two six-cylinder chassis. A parallel case may be cited in the Lozier line.

The inevitable question of features is next to be considered. The last column of the buyer's guide shows that some makers are continuing the features of former years. The Packard water governor is a decided attraction. This, however, does not mean the absence of a lighting system or starting

Electric Lighting Systems

Alphabetical List of Cars with Electrically Illuminated Lamps

ELECTRIC lighting is accomplished in a number of ways, the simplest being by means of a storage battery. But the buyer ordinarily is not satisfied with this uncertain method of lighting; he wants a positive means of illumination and the manufacturer, in the majority of cases, gives the purchaser what he wants—a generator. Of course, in the cheaper makes of motor cars, it is not profitable to the maker to supply a generator as part of the regular equipment, so in this

LIGHTING SYSTEMS

Abbott-Detroit	Autolite
Alco, 11-60	Gray & Davis
Alpena	Electro
Ames	Dynamo
American	Electro
Amplex	Northeast
Atlas	Deaco
Auburn	Ward-Leonard
Austin	Leece-Neville
Bergdoll	U. S. L.
Bergdoll, D-40	Westinghouse
Cadillac	Delco
Carroll	Apco
Cartercar, 5	Jones
Case, O	Westinghouse
Chadwick	Gray & Davis
Chalmers	Gray & Davis
Chevrolet	Gray & Davis
Cino	Dynamo
Colby	Gray & Davis
Cole	Delco
Columbia	Gray & Davis
Corbitt	Northeast
Crawford, 13-30	Gray & Davis
Croxton	Northeast
Cunningham	Generator
Davis	Gray & Davis
Dorris	Apco
Duquesne	Generator
Edwards	U. S. L.
Falcar	Eigenac
Fiat	Gray & Davis
Firestone-Columbus	Northeast
Flanders, 40	Gray & Davis
Franklin, M	Entz
Garford, G-15	U. S. L.
Glide, 36	Ward-Leonard
Great Southern, 51	U. S. L.
Grout	Ward-Leonard
Halladay, 32	Deaco
Halladay, 40	Jones
Havers, 55	Northeast
Haynes	Leece-Neville
Henderson	Ward-Lenoard
Holly, A	Ward-Leonard
Hudson	Delco
Imperial	Northeast
Inter-State	Apco
Jackson	Autolite
Kissell	Esterline
Klinekar	Rushmore
Knox	Berdon
Lenox	Gray & Davis
Lexington, 13-6	Electro

arrangement, for such is not the case. The King patent spring suspension is always worthy of consideration, as is the friction drive of the Cartercar and Lambert cars. The underslung frame of the American, Regal, Norwalk and Omaha is the prominent characteristic of these cars. Engine starters of every possible make are in use, the electric starter dominating. The Sexto-auto, which last year was the Octo-auto, is a six-wheeled car with a number of advantages in the way of tire economy and ease of riding.

Left-hand steering and center control is used as a feature of many makes. Among the advocates of this design will be found R. C. H., Herreshoff, Case, Cino and others. Wire wheels are in use on ten makes—Stutz, Pathfinder, Keeton, Edwards, Cino, Arbenz, Holley, Stoddard, Firestone and Henderson.

Battery or Dynamo Lights

1913 Motor Cars Equipped for Night Driving with Design Employed

case the storage battery answers the purpose well. The Ward-Leonard, Esterline, Gray & Davis, Deaco, Westinghouse, U. S. L. Delco and Northeast systems are only part of the number to be found in the buyer's guide. Some makers do not give an electric lighting plant as equipment, believing that more attention should be paid to the chassis proper. In such cases a lighting outfit will be installed at extra cost, but is not listed in the buyers' guide as equipment.

LIGHTING SYSTEMS—Continued

Locomobile	Adlake
Lozier, 77	Gray & Davis
Luverne, 76	Gray & Davis
Marion	Dynamo
Marmon, 32	Northeast
Matheson, C	Westinghouse
McFarlan	Vesta
Michigan	Northeast
Mitchell	Esterline
Midland	Gray & Davis
Moline	Ward-Leonard
Moon	Wagner
Morse	Gray & Davis
National	Gray & Davis
Norwalk	Gray & Davis
Nyberg	Generator
Oakland	Deaco
Oldsmobile	Generator
Overland, 69	U. S. L.
Packard	Delco
Palmer-Singer	Dyneto
Paige	Gray & Davis
Pathfinder	Gray & Davis
Paterson	Deaco
Peerless	Gray & Davis
Pierce, 38, 48B & 66	Westinghouse
Pierce, 48D	Adams-Westlake
Pope-Hart	Generator
Pratt, 50	Gray & Davis
Pratt, 30	Deaco
Premier, 6-40	Dynamo
Premier	Generator
Pullman	Vesta
Rambler, Cross C	U. S. L.
Reeves, Sextoauto	Esterline
Republic	Delco
Richmond, P	Esterline
Selden, 48	Gray & Davis
Spaulding, G	Gray & Davis
Spoerer, 40	Gray & Davis
Spoerer, 25A	Berdon
Speedwell, G	Apco
Speedwell, Rotary	Wagner
Staver	Generator
Stearns Knight	Generator
Stevens-Duryea, C	Adlake
Stoddard-Dayton	Generator
Stutz	Esterline
Velie	Gray & Davis
Warren	Northeast
Westcott, 40	Dynamo
White	Own
Winton	Generator
Zimmerman, Z-46	Deaco

BUYERS' GUIDE—$1,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Carhartt, K	Run	1,450	3	26.40	109	34x4	34x4		
Carhartt, K	Tour	1,450	5	26.40	109	34x4	34x4		
Carhartt, B	Run	1,850	3	32.40	119	34x4	34x4		
Carhartt, B	Tour	1,850	5	32.40	119	34x4	34x4		
Cartercar, 5	Road	1,600	2	27.25	116	36x4	36x4	Jesco	Friction Drive
Cartercar, 5	Tour	1,700	5	27.25	116	36x4	36x4	Jesco	Friction Drive
Cartercar, 5	Coupe	1,900	3	27.25	116	36x4	36x4	Jesco	Friction Drive
Case, N	Road	1,350	2	27.25	115	34x4	34x4	Westinghouse	Center Control
Case, N	Tour	1,500	5	27.25	115	34x4	34x4	Westinghouse	Center Cotnrol
Case, O	Road	1,985	2	32.40	125	37x4½	37x4½	Westinghouse	Elec Starter
Colby, C	Road	1,800	2	27.25	118	34x4½	34x4½	Gray & Davis	Air Starter
Colby, C	Tour	1,800	5	27.25	118	34x4½	34x4½	Gray & Davis	Air Starter
Cutting, A-40	Road	1,475	2	25.60	120	36x4	36x4	Battery	Acet Starter
Cutting, B-40	Tour	1,475	5	25.60	120	36x4	36x4	Battery	Acet Starter
Crawford, 13-30	Road	1,750	2	27.25	115	34x4	34x4	Gray & Davis	Elec Starter
Crawford, 13-30	Tour	1,750	5	27.25	115	34x4	34x4	Gray & Davis	Elec Starter
Crow-Elkhart, C-3	Road		2	25.60	114	34x3½	34x3½		Acet Starter
Crow-Elkhart, C-4	Tour		5	25.60	114	34x3½	34x3½		Acet Starter
Crow-Elkhart, C-5	Tour		5	27.25	122	35x4	35x4		
Correja, T & D	Run	1,650	2	28.90	125	36x4	36x4	Battery	Starter
Correja, T & D	Tour	1,650	4	28.90	125	36x4	36x4	Battery	Starter
Correja, T & D	Tour	1,650	5	28.90	125	36x4	36x4	Battery	Starter
Correja, A	Run	1,450	2	28.90	105	34x3½	34x3½	Optional	
Correja, C	Road	1,450	2	28.90	105	34x3½	34x3½	Optional	
Correja, B	Coupe	1,850	2	28.90	105	34x3½	34x3½	Optional	
Correja, S & R	Run	1,950	2	28.90	120	36x4	36x4	Battery	Starter
Correja, G	Run	1,850	2	19.60	125	34x4	34x4	Battery	Starter
Correja, J	Tour	1,850	5	19.60	125	34x4	34x4	Battery	Starter
Corbitt, D	Run	1,800	2	25.60	120	34x4	34x4	Northeast	Elec Starter
Corbitt, E	Tour	1,875	4	25.60	120	34x4	34x4	Northeast	Elec Starter
Corbitt, F	Tour	1,875	5	25.60	120	34x4	34x4	Northeast	Elec Starter
Cino, 440-A	Tour	1,600	5	32.60	120	34x4	34x4	Not Known	Center Control
Cino, 440-R	Road	1,600	2	32.60	120	34x4	34x4	Not Known	Center Control
Cino, 450	Tour	1,850	5	32.60	120	34x4	34x4	Dynamo	Elec Starter
Cole, 40	Run	1,685	2	27.25	116	36x4	36x4	Delco	Elec Starter
Cole, 40	Tour	1,685	5	27.25	116	36x4	36x4	Delco	Elec Starter
Cole, 50	Run	1,985	2	32.40	122	36x4	36x4	Delco	Elec Starter
Cole, 50	Tour	1,985	5	32.40	122	36x4	36x4	Delco	Elec Starter
Davis, 40C	Run	1,850	2	27.25	118	36x4	36x4	Gray & Davis	Starter
Davis, 40E	Tour	1,850	4	27.25	118	36x4	36x4	Gray & Davis	Starter
Davis, 40D	Tour	1,850	5	27.25	118	36x4	36x4	Gray & Davis	Starter
Davis, 50A	Tour	1,950	2	32.40	118	36x4	36x4	Gray & Davis	Starter
Davis, 50B	Run	1,950	2	32.40	118	36x4	36x4	Gray & Davis	Starter
Day Utility, D	Tour	1,500	5	25.60	115	34x4	34x4	Battery	Left-hand Steer
Enger, F	Tour	1,475	5	32.40	120	34x4	34x4		Center Control
Enger, J	Tour	1,475	4	32.40	120	34x4	34x4		Center Control
Enger, E	Road	1,475	2	32.40	120	34x4	34x4		Center Control
Enger, P	Tour	1,750	5	32.40	120	36x4	36x4	Battery	Elec Starter
Falcar, 35	Run	1,850	2	27.25	116	34x4	34x4	Elgenac	Left-hand Control
Falcar, 35	Road	1,850	3	27.25	116	34x4	34x4	Elgenac	Left-hand Control
Falcar, 35	Toy Ton	1,850	4	27.25	116	34x4	34x4	Elgenac	Left-hand Control
Falcar, 35	Tour	1,850	7	27.25	116	34x4	34x4	Elgenac	Left-hand Control
Flanders, 40	Tour	1,550	5	31.60	118	34x4	34x4	Gray & Davis	Six Cylinder
Franklin, G	Run	1,650	2	25.60	100	32x3½	32x3½		Air-Cooled
Glide, 36	Speed	1,690	2	27.25	118	34x4	34x4	Ward-Leonard	Acet Starter
Glide, 36	Tour	1,690	5	27.25	118	34x4	34x4	Ward-Leonard	Acet Starter
Great Southern, 30	Road	1,400	2	25.60	113	34x4	34x4	Battery	Acet Starter
Great Southern, 30	Tour	1,400	5	25.60	113	34x4	34x4	Battery	Acet Starter
Great Western, 1913	Road	1,585	2	28.90	118	36x4	36x4	Battery	Acet Starter
Great Western, 1913	Tour	1,585	4	28.90	118	36x4	36x4	Battery	Acet Starter
Great Western, 1913	Tour	1,585	5	28.90	118	36x4	36x4	Battery	Acet Starter
Halladay, 40	Road	1,800	2	32.40	118	36x4	36x4	Jesco	Elec Starter
Halladay, 40	Toy Ton	1,800	4	32.40	118	36x4	36x4	Jesco	Elec Starter
Halladay, 40	Tour	1,800	5	32.40	118	36x4	36x4	Jesco	Elec Starter
Havers, 44	Road	1,850	2	33.75	122	36x4	36x4	Optional	Six Cylinders
Havers, 44	Tour	1,850	4	33.75	122	36x4	36x4	Optional	Six Cylinders
Havers, 44	Tour	1,850	5	33.75	122	36x4	36x4	Optional	Six Cylinders
Henderson, 44	Road	1,385	2	27.25	116	34x4	34x4	Ward-Leonard	Dash Fuel Tank
Henderson, 46	Tour	1,485	5	27.25	116	34x4	34x4	Ward-Leonard	Dash Fuel Tank
Herreshoff, 30	Run	1,250	2	18.25	100	34x4	34x4	Storage Battery	Left-hand Steer
Herreshoff, 30	Tour	1,350	5	18.25	110	34x4	34x4	Storage Battery	Left-hand Steer
Herreshoff, 36	Run	1,700	2	27.25	124	34x4	34x4	Storage Battery	Six Cylinders
Herreshoff, 36	Tour	1,700	5	27.25	124	34x4	34x4	Storage Battery	Six Cylinders
Hudson, 37	Road	1,875	2	27.25	118	36x4	36x4	Delco	Elec Starter
Hudson, 37	Torpedo	1,875	5	27.25	118	36x4	36x4	Delco	Elec Starter
Hudson, 37	Tour	1,875	5	27.25	118	36x4	36x4	Delco	Elec Starter
Imperial, 34	Tour	1,650	5	32.40	118	34x4	34x4	Northeast	Elec Starter
Imperial, 44	Tour	1,875	5	36.10	122	36x4	36x4	Northeast	Elec Starter
Jackson, Olympic	Tour	1,500	5	27.25	115	34x4	34x4	Not Known	Acet Starter
Jackson, Majestic	Tour	1,850	5	32.40	124	36x4	36x4	Auotlite	Acet Starter
King, 1913	Tour	1,500	5	25.60	115	34x4	34x4	Not Known	King Patent Spr
Kissel, 30	Semi-Rac.	1,700	2	28.90	116	34x4	34x4	Esterline	Elec Starter
Kissel, 30	Semi-Tour	1,700	5	28.90	116	34x4	34x4	Esterline	Elec Starter
Klinekar, 4-30	Run	1,850	2	25.60	115	34x4	34x4	Rushmore	Starter

BUYERS' GUIDE—$1,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE.	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Klinekar, 4-30	Toy Ton	1,850	4	25.60	115	34x4	34x4	Rushmore	Starter
Klinekar, 4-30	Tour	1,850	5	25.60	115	34x4	34x4	Rushmore	Starter
Lambert, 99	Tour	1,250	5	28.90	117	34x3½	34x3½		Friction Drive
Little Six	Tour	1.285	5	23.06	106	32x4	32x4		
Marathon, Winner	Road	1,275	2	28.90	116	34x4	34x4		
Marathon, Winner	Tour	1,350	5	28.90	116	34x4	34x4		
Marathon, Winner	Coupe	1,600	2	28.90	116	34x4	34x4		
Marathon, Champion	Road	1,675	2	32.40	123	36x4	36x4		
Marathon, Champion	Tour	1,750	5	32.40	123	36x4	36x4		
Marathon, Champion	Tour	1,800	7	32.40	123	36x4	36x4		
Marion, 37A	Tour	1,475	5	25.60	112	34x4	34x4	Dynamo	Acet Starter
Marion, 36A	Road	1,425	2	25.60	112	34x4	34x4	Dynamo	Acet Starter
Marion, 48A	Tour	1,850	5	27.25	120	36x4	36x4	Dynamo	Elec Starter
Mason, K	Run	1,290	2	25.60	116	36x3½	36x3½		
Mason, K	Tour	1,290	5	25.60	116	36x3½	36x3½		
Maxwell, 10	Road	1,675	2	28.90	115	36x4	36x4	Battery	Acet Starter
Maxwell, 10	Tour	1,675	5	28.90	115	36x4	36x4	Battery	Acet Starter
McIntyre, G-13	Run	1,485	2	29.40	116	34x4	34x4	Not Known	Six Cylinders
McIntyre, G-13	Tour	1,485	5	29.40	116	34x4	34x4	Not Known	Six Cylinders
Michigan, R	Tour	1,585	5	28.90	118	35x4½	35x4½	Northeast	Elec Starter
Michigan, S	Road	1,585	2	28.90	118	35x4½	35x4½	Northeast	Elec Starter
Michigan, L	Tour	1,400	5	26.40	114	34x4	34x4	Northeast	Elec Starter
Michigan, O	Road	1,400	2	26.40	114	34x4	34x4	Northeast	Elec Starter
Midland, T-4	Road	1,685	2	32.40	121	34x4	34x4	Gray & Davis	Elec Starter
Midland, T-4	Speed	1,685	2	32.40	121	34x4	34x4	Gray & Davis	Elec Starter
Midland, T-4	Tour	1,685	5	32.40	121	34x4	34x4	Gray & Davis	Elec Starter
Miller, 40	Tour	1,450	5	27.25	116	34x4	34x4	Battery	
Mitchell, 5-4	Run	1,500	2	28.90	120	36x4	36x4	Esterline	Elec Starter
Mitchell, 5-4	Tour	1,500	5	28.90	120	36x4	36x4	Esterline	Elec Starter
Mitchell, 5-6	Run	1,850	2	33.75	132	36x4	36x4	Esterline	Six Cylinders
Mitchell, 5-6	Tour	1,850	5	33.75	132	36x4	36x4	Esterline	Six Cylinders
Moline, M-40	Road	1,950	2	27.25	124	36x4	36x4	Ward-Leonard	Elec Starter
Moline, M-40	Tour	1,950	5	27.25	124	36x4	36x4	Ward-Leonard	Elec Starter
Moon, 39	Road	1,650	2	25.60	116	34x4	34x4	Wagner	Elec Starter
Moon, 39	Torpedo	1,650	4	25.60	116	34x4	34x4	Wagner	Elec Starter
Moon, 39	Tour	1,650	5	25.60	116	34x4	34x4	Wagner	Elec Starter
Moon, 48	Road	1,985	2	32.40	121	36x4	36x4	Wagner	Elec Starter
Moon, 48	Torpedo	1,985	4	32.40	121	36x4	36x4	Wagner	Elec Starter
Moon, 48	Tour	1,985	5	32.40	121	36x4	36x4	Wagner	Elec Starter
Nyberg, 37	Road	1,285	2	22.50	118	34x4	34x4		
Nyberg, 37	Tour	1,295	5	22.50	118	34x4	34x4		
Nyberg, 40	Road	1,400	2	28.90	118	36x4	36x4		
Nyberg, 40	Tour	1,450	5	28.90	118	36x4	36x4		
Nyberg, 40	Tour	1,550	7	28.90	128	34x4	34x4		Starter
Nyberg, 6-45R	Road	1,700	2	33.75	126	36x4	36x4	Generator	Elec Starter
Nyberg, 6-45	Tour			33.75	136	36x4	36x4	Generator	Elec Starter
Nyberg, 6-45	Tour		7	33.75	136	36x4	36x4	Generator	Elec Starter
Oakland, 42	Road	1,600	3	27.25	116	34x4	34x4	Deaco	Air Starter
Oakland, 42	Toy Ton	1,600	4	27.25	116	34x4	34x4	Deaco	Air Starter
Oakland, 42	Tour	1,600	5	27.25	116	34x4	34x4	Deaco	Air Starter
Omaha, 42	Road	1,385	2	26.40	116	36x4	36x4		Underslung
Omaha, 42	Tour	1,385	5	26.40	116	36x4	36x4		Underslung
Only, A	Tour	1,250	5	28.90	112	32x3½	32x3½		Long Stroke
Overland, 69	Coupe	1,500	3	25.60	110	32x3½	32x3½	U. S. L.	Elec Starter
Overland, 71	Road	1,475	2	30.63	114	34x4	34x4	Battery	Acet Starter
Overland, 71	Tour	1,475	4	30.63	114	34x4	34x4	Battery	Acet Starter
Overland, 71	Tour	1,475	5	30.63	114	34x4	34x4	Battery	Acet Starter
Pacific Special, A	Tour	1,950	5	32.40	121	34x4	34x4		Acet Starter
Pacific Special, B	Road	1,950	2	32.40	121	34x4	34x4		Acet Starter
Paige, 25	Coupe	1,500	3	22.50	110	33x4	33x4	Gray & Davis	Elec Starter
Paige, 25	Coupe	1,600	5	22.50	110	33x4	33x4	Gray & Davis	Elec Starter
Paige, 36	Tour	1,275	5	25.60	116	34x4	34x4	Gray & Davis	Elec Starter
Paige, 36	Road	1,275	2	25.60	116	34x4	34x4	Gray & Davis	Elec Starter
Paige, 36	Coupe		3	25.60	116	34x4	34x4	Gray & Davis	Elec Starter
Paige, 36	Coupe		5	25.60	116	34x4	34x4	Gray & Davis	Elec Starter
Paterson, 43	Tour	1,685	5	27.25	116	34x4	34x4	Deaco	Elec Starter
Paterson, 47	Tour	1,985	7	32.40	122	36x4	36x4	Deaco	Elec Starter
Pathfinder, 13	Tour	1,875	5	27.25	120	36x4	36x4	Gray & Davis	Elec Starter
Pathfinder, 13	Phaeton	1,875	4	27.25	120	36x4	36x4	Gray & Davis	Elec Starter
Pathfinder, 13	Road	1,875	2	27.25	120	36x4	36x4	Gray & Davis	Elec Starter
Pilot, 50	Tour		5	32.40	126	36x4	36x4	Battery	Elec Starter
Pratt, 30	Road	1,400	2	25.60	114	32x3½	32x3½	Deaco	Acet Starter
Pratt, 30	Tour	1,400	5	25.60	114	32x3½	32x3½	Deaco	Acet Starter
Pratt, 40	Road	1,850	2	32.40	120	36x4	36x4	Gray & Davis	Acet Starter
Pratt, 40	Tour	1,850	5	32.40	120	36x4	36x4	Gray & Davis	Acet Starter
Pratt, 40	Tour	1,950	7	32.40	120	36x4	36x4	Gray & Davis	Acet Starter
Pullman, 4-36	Tour	1,675	5	26.40	118	34x4	34x4		
Pullman, 4-36	Tour	1,850	5	26.40	118	34x4	34x4	Battery	Elec Starter
Rambler, Cross-C	Tour	1,700	5	32.40	120	36x4	36x4	U. S. L.	Elec Starter
Rambler, Cross-C	Tour	1,700	4	32.40	120	36x4	36x4	U. S. L.	Elec Starter
Rambler, Cross-C	Road	1,650	2	32.40	120	36x4	36x4	U. S. L.	Elec Starter
Rambler, Cross-C	Tour	1,900	7	32.40	120	37x4½	37x4½	U. S. L.	Elec Starter
R. C. H.	Coupe	1,300	2	16.90	110	32x3½	32x3½	Battery	Left-hand Steer
Regal	Coupe	1,250	3	22.50	100	32x3½	32x3½	Battery	Underslung

Engine Starter Equipment

Most of the New Cars to Be Fitted with Automatic Cranking Arrangement

STARTING equipment, as shown in the tables on these pages, is given as regular equipment on the cars named, but it must be remembered that if the same make of starter is used on two different cars it does not necessarily follow that the starters are the same. For example, the Delco installation on the Cadillac for this year is quite different from that used on the Hudson. The Delco starter is made by the Dayton Engineering Laboratories Co. and appears in a different form on each different make of motor car. The reason for this is that the starter is installed to comply with motor design.

In some instances the make of starter is not given. This state of affairs is usually due to the fact that the manufacturer of the motor car is undecided as to the make, but wishes to make it known that the starter will be of a certain type. The A.E.C., Jackson and McIntyre are examples of such cars. In a number of cases the manufacturer has decided to leave the selection of the starter entirely to the purchaser.

The Nyberg, Klinekar, Davis, Chadwick

CARS EQUIPPED WITH STARTERS

Car	Starter and Type
Abbott-Detroit	Auto-Lite, Electric
Adams-Farwell	Own, Lever
A. E. C., 6-45	Own, Electric
A. E. C., 6-60	Air
Aipena	Electro, Electric
American, Scout	Disco, Acetylene
American Traveler	Peru, Electric
Amplex	Northeast, Electric
Apperson	Ward-Leonard, Electric
Atlas	Gray & Davis, Electric
Austin	Own, Air
Bergdoll	U. S. L., Electric
Buick	Disco, Acetylene
Cadillac	Delco, Electric
Carroll	National, Mechanical
Cartercar	Jones, Electric
Case, O	Westinghouse, Electric
Chadwick	Optional, Optional
Chalmers	Own, Air
Chevrolet	English, Air
Cino, 660	Electro, Electric
Colby, C. & E	Thurber, Air
Colby, C-6-60	Gray & Davis, Electric
Cole	Delco, Electric
Corbitt	Northeast, Electric
Correja, T., D. S. & R.	Volkmer, Mechanical
Correja, C 7 J	Electric
Crane	Own, Air
Crawford	Gray & Davis, Electric
Crow-Elkhart, C	Prest-O-Lite, Acetylene
Crow-Elkhart, B	Electric
Croxton	Northeast, Electric
Cunningham	Electric
Cutting	Hanna, Acetylene
Davis	Optional, Optional
Dorris	Apico, Electric
Duryea	Own, Lever
Edwards	U. S. L., Electric
Firestone-Col.	Northeast, Electric
Flanders	Gray & Davis, Electric
Franklin, M, D, H	Entz, Electric
Garford, G15	U. S., Electric
Glide	Disco, Acetylene
Great Southern, 30	Prest-O-Lite, Acetylene
Great Southern, 51	Optional, Optional
Great Western	Prest-O-Lite, Acetylene
Grout	Ward-Leonard, Electric
Halladay, 40	Jones, Electric
Havers, 44	Disco, Acetylene
Havers, 55	Northeast, Electric
Haynes	Leece-Neville, Electric
Henderson	Disco, Acetylene
Hudson	Delco, Electric
Imperial	Northeast, Electric
Interstate	Apico, Electric
Jackson, Oly. & Maj	Disco, Acetylene
Jackson, Sultanic	Electric
Kisselkar	Own, Electric
Klinekar, 30	Optional, Optional
Klinekar, 40, 50, 60	Ever Ready, Mechanical

Motor Cranking Systems

Popularity of Latest Development in Industry—List of Cars with this Feature

and Michigan are cars that will be equipped with any make of starter desired by the buyer. In the majority of cases the generator used for starting is also used as a source of current for lighting and ignition. The Gray & Davis, Wagner and U.S.L. are examples of such combination systems.

The table below shows at a glance that the electric motor starter is fast superseding the acetylene, lever and other forms. It should not be taken from this that an electric device of this kind is superior to any other, for this may not be the case. The conclusion to be drawn is that the starter is made to comply with motor design and where one type would be inefficient another would prove highly satisfactory. The tables printed below show that 120 different manufacturers are equipping their cars with starters.

Glancing at the starters as segregated by type, it is seen that the air, mechanical, spring and lever starters have little following, as compared with the electric and acetylene. The latter is losing the popularity it enjoyed during the early part of last year.

Car	Starter and Type
Knox	Perkins, Acetylene
Lenox	Gray & Davis, Electric
Lexington	E. L. & S., Electric
Locomobile	Disco, Acetylene
Lozier	Gray & Davis, Electric
Luverne	Gray & Davis, Electric
Marion, 36A & 37A	Disco, Acetylene
Marion, 48A	Electric
Marmon	Northeast, Electric
Matheson	Westinghouse, Electric
Maxwell	Own, Acetylene
McFarlan	Own, Air
McIntyre	Electric
Michigan	Optional, Optional
Midland	Gray & Davis, Electric
Mitchell	Esterline, Electric
Moline	Ward-Leonard, Electric
Moon	Wagner, Electric
National	Gray & Davis, Electric
Norwalk	Gray & Davis, Electric
Nyberg	Optional, Optional
Oakland	Own, Air
Oldsmobile	Delco, Electric
Overland	Own, Acetylene
Pacific Special	Prest-O-Lite, Acetylene
Packard, 48	Delco, Electric
Paige, 36	Gray & Davis, Electric
Palmer-Singer	Own, Air
Paterson	Deaco, Electric
Pathfinder	Gray & Davis, Electric
Peerless, 35, 36, 37	Own, Electric
Pierce-Arrow, C. D. A	Own, Air
Pierce-Arrow, D	Disco, Acetylene
Pilot	Gray & Davis, Electric
Pope-Hartford	Gray & Davis, Electric
Pratt, 30, 40	Prest-O-Lite, Acetylene
Pratt, 50	Gray & Davis, Electric
Premier	Own, Air
Pullman, 44, 66	Ever Ready, Spring
Rambler, Cross C	U. S. L., Electric
Reo, The Fifth	Own, Acetylene
Republic, E	Delco, Electric
Selden	Disco, Acetylene
Simplex	Disco, Acetylene
Spaulding	Gray & Davis, Electric
Speedwell	Apico, Electric
Speedwell, Rotary	Wagner, Electric
Spoerer	Esterline, Electric
Staver	Own, Air
Stearns, Knight	Ever Ready, Spring
Stearns, Knight	Gray & Davis, Electric
Stevens-Duryea	Disco, Acetylene
Stoddard-Dayton, 30 and 38	Own, Acetylene
Studebaker, 25	Acetylene
Studebaker, Six and 35	Wagner, Electric
Triumph	Own, Air
Velie, Dispatch & 40	Gray & Davis, Electric
Warren, Resolute	Northeast, Electric
Westcott	Electro, Electric
White	Own, Electric
Winton	Own, Air

BUYERS' GUIDE—$1,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Regal, H	Tour	$1,400	5	28.90	118	34x4	34x4	Battery	Underslung
Regal, C	Tour	1,250	5	25.60	116	34x4	34x4	Battery	
Reo, The Fifth	Limousine	1,600	7	25.60	112	34x4	34x4	Battery	Acet Starter
Richmond, P	Tour	1,750	5	32.40	120	36x4	36x4	Esterline	Elec Starter
Schacht, NS	Tour	1,775	5	28.90	120	36x4	36x4		Elec Starter
Schacht, KL	Road	1,775	2	28.90	120	36x4	36x4		Elec Starter
Spaulding, G	Tour	1,650	5	28.90	120	36x4	36x4	Gray & Davis	Elec Starter
Spaulding, G	Road	1,600	2	28.90	120	36x4	36x4	Gray & Davis	Elec Starter
Spoerer, 25-A	Run	1,900	2	27.25	120	35x4	35x4	Berdon	Elec Starter
Staver, 45	Run	1,750	2	32.40	113	34x4	34x4		Air Starter
Staver, 45	Road	1,750	2	32.40	113	34x4	34x4		Air Starter
Staver, 45	Tour	1,750	5	32.40	113	34x4	34x4		Air Starter
Staver, 45	Semiracer	1,750	2	32.40	116	34x4	34x4	Battery	Air Starter
Staver, 45	Fore door	1,750	2	32.40	116	34x4	34x4	Battery	Air Starter
Staver, 45	Tour	1,750	5	32.40	116	34x4	34x4	Battery	Air Starter
Stoddard-Day., 30	Road	1,350	2	25.00	112	34x4	34x4		Acet Starter
Stoddard-Day., 30	Tour	1,450	5	25.00	112	34x4	34x4		Acet Starter
Stoddard-Day., 38	Road	1,750	2	28.90	114	35x4½	35x4½		Acet Starter
Stoddard-Day., 38	Tour	1,850	5	28.90	114	35x4½	35x4½		Acet Starter
Studebaker, 30	Coupe	1,475	5	25.60	112	32x3½	32x3½		
Studebaker, 35	Coupe	1,850	2	27.25	115½	34x4	34x4	Battery	Elec Starter
Studebaker, 35	Tour	1,290	6	27.25	115½	34x4	34x4	Battery	Elec Starter
Studebaker, Six	Road	1,550	2	29.40	121	34x4	34x4	Battery	Six Cylinders
Studebaker, Six	Tour	1,550	6	29.40	121	34x4	34x4	Battery	Six Cylinders
Velie, Dispatch	Road	1,450	2	22.50	113	34x4	34x4	Gray & Davis	Elec Starter
Velie, Dispatch	Tour	1,500	5	22.50	113	34x4	34x4	Gray & Davis	Elec Starter
Velie, 32	Tour	1,350	5	22.50	113	34x3½	34x3½		
Warren, 30	Road	1,250	2	27.25	110	34x4	34x4		Elec Starter
Warren, 30	Tour	1,250	5	27.25	110	34x4	34x4		Elec Starter
Warren, 40	Tour	1,415	5	27.25	110	34x4	34x4	Northeast	Elec Starter
Westcott, 40	Tour	1,975	5	32.40	120	36x4	36x4	Dynamo	Elec Starter
Westcott, 40	Torpedo	1,975	4	32.40	120	36x4	36x4	Dynamo	Elec Starter
Westcott, 40	Road	1,975	2	32.40	120	36x4	36x4	Dynamo	Elec Starter
Zimmerman, Z-40	Tour	1,600	5	30.75	116	35x4	35x4		
Zimmerman, Z-46	Tour	1,950	5	33.75	128	36x4	36x4	Deaco	Six Cylinders

$2,500 CLASS

Abbott-Detroit, E	Tour	$2,000	7	32.40	121	36x4½	36x4½	Generator	Elec Starter
Abbott-Detroit, E	Road	2,150	2	32.40	121	36x4½	36x4½	Generator	Elec Starter
A. E. C., 6-45	Tour	2,500	5	33.75	130	36x4½	36x4½	Not Known	Elec Starter
A. E. C., 6-45	Road	2,500	2	33.75	130	36x4½	36x4½	Not Known	Elec Starter
Alpena, N-6-50	Road	2,200	2	33.75	135	36x4	36x4	Electro	Elec Starter
Alpena, N-6-50	Tour	2,250	4	33.75	135	36x4	36x4	Electro	Elec Starter
Alpena, N-6-50	Tour	2,250	5	33.75	135	36x4	36x4	Electro	Elec Starter
Alpena, N-6-50	Tour	2,390	6	33.75	135	36x4	36x4	Electro	Elec Satrter
Alpena, N-6-50	Tour	2,390	7	33.75	135	36x4	36x4	Electro	Elec Starter
American, Tour, 34A	Tour	2,350	4	32.40	118	37x4	37x4	Electro	Underslung
American, 32A	Road	2,350	2	32.40	118	37x4	37x4	Electro	Underslung
Apperson, 4-45	Coupe	2,100	4	32.40	114	34x4	34x4	Not Known	Elec Starter
Apperson, 4-55	Tour	2,000	5	36.10	118	36x4	36x4	Not Known	Elec Starter
Apperson, 4-55	Tour	2,250	7	36.10	122	36x4½	36x4½	Not Known	Elec Starter
Auburn, 40L	Town Car	2,500	5	32.40	122	36x4	36x4	Ward-Leonard	
Auburn, 6-45	Tour	2,000	5	33.75	130	36x4	36x4	Ward-Leonard	
Auburn, 6-45	Road	2,000	2	33.75	130	36x4	36x4	Ward-Leonard	
Auburn, 6-45	Coupe	2,600	5	33.75	130	36x4	36x4	Ward-Leonard	
Bergdoll, C-30	Limousine	2,400	7	25.60	115	34x4	34x4	U. S. L.	Elec Starter
Bergdoll, 40	Tour	2,000	5	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Bergdoll, 40	Tour	2,100	7	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Bergdoll, 40	Torpedo	2,000	4	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Bergdoll, 40	Road	2,000	2	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Bergdoll, D-40	Limousine	2,600	7	25.60	115	34x4	34x4	Westinghouse	Elec Starter
Burg, R	Tour	2,450	5	40.90	134	36x4½	36x4½		
Cadillac, 1913	Tour	2,075	6	32.40	120	36x4½	36x4½	Delco	Elec Starter
Cadillac, 1913	Coupe	2,500	4	32.40	120	36x4½	36x4½	Delco	Elec Starter
Carroll, 4E	Road	2,250	2	32.40	118	36x4	36x4	Apico	Spring Starter
Carroll, 4E	Road	2,250	3	32.40	118	36x4	36x4	Apico	Spring Starter
Carroll, 4E	Tour	2,400	4	32.40	118	36x4	36x4	Apico	Spring Starter
Carroll, 4E	Tour	2,400	5	32.40	118	36x4	36x4	Apico	Spring Starter
Carroll, 4E	Tour	2,400	6	32.40	118	36x4	36x4	Apico	Spring Starter
Cartercar, 5	Sedan	2,000	5	27.25	116	36x4	36x4	Jesco	Friction Drive
Case, O	Tour	2,050	5	32.40	125	37x4½	37x4½	Westinghouse	Elec Starter
Chalmers, 17	Tour	2,150	7	28.90	118	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 17	Coupe	2,250	4	28.90	118	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 18	Tour	2,400	5	43.80	130	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 18	Tour	2,600	7	43.80	130	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 18	Torpedo	2,900	4	43.80	130	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 18	Road	2,400	2	43.80	130	36x4½	36x4½	Gray & Davis	Air Starter
Chalmers, 18	Coupe	2,700	4	43.80	130	36x4½	36x4½	Gray & Davis	Air Starter
Chevrolet, C	Tour	2,100	6	31.95	120	35x4½	35x4½	Gray & Davis	Air Starter
Cino, 660	Tour	2,700	7	38.25	132	36x4½	36x4½	Dynamo	Elec Starter
Cino, 660	Road	2,700	2	38.25	132	36x4½	36x4½	Dynamo	Elec Starter
Coey, A	Tour	2,000	4	38.40	128	36x4	36x4		Six Cylinders

BUYERS' GUIDE—$2,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Coey, B	Road	2,000	2	38.40	128	36x4	36x4		Six Cylinders
Colby, E	Tour	2,060	5	25.60	128	36x4½	36x4½	Gray & Davis	Air Starter
Colby, E	Tour	2,100	7	25.60	128	36x4½	36x4½	Gray & Davis	Air Starter
Colby, 6-60	Tour	2,500	5 & 7	40.90	138	37x5	37x5	Gray & Davis	Elec Starter
Colby, 6-60	Road	2,500	2	40.90	138	37x5	37x5	Gray & Davis	Elec Starter
Cole, 50	Coupe	2,500	4	32.40	122	36x4	36x4	Delco	Elec Starter
Cole, 60	Tour	2,485	6	40.90	132	37x4½	37x4½	Delco	Elec Starter
Correja, T & D	Limousine	2,300	4 & 6	28.90	125	36x4	36x4	Battery	Spring Starter
Correja, S & R	Tour	2,150	4 & 5	43.80	125	36x4	36x4	Battery	Spring Starter
Correja, S & R	Tour	2,350	7	43.80	125	36x4	36x4	Battery	Spring Starter
Correja, S &R	Limousine	2,750	4	43.80	125	36x4	36x4	Battery	Spring Starter
Correja, S & R	Limousine	2,950	7	43.80	125	36x4	36x4	Battery	Spring Starter
Correja, R	Run	2,250	2	38.40	125	34x4	34x4	Battery	
Correja, S	Tour	2,250	5	38.40	125	34x4	34x4	Battery	
Crawford, 13-40	Road	2,050	2	32.40	125	36x4	36x4	Gray & Davis	Elec Starter
Crawford, 13-40	Tour	2,100	5	32.40	125	36x4	36x4	Gray & Davis	Elec Starter
Crow-Elkhart, C-7	Road		2	32.40	122	36x4	36x4	Battery	Acet Starter
Crow-Elkhart, C-8	Tour		5	32.40	122	36x4	36x4	Battery	Acet Starter
Crow-Elkhart, C-9	Tour		7	32.40	122	36x4	36x4	Battery	Acet Starter
Crow-Elkhart, C-6B	Tour		5	33.75	122	35x4½	35x4½	Apico	Elec Starter
Crow-Elkhart, C-6A	Tour		7	40.90	137	37x4½	37x4½	Battery	Acet Starter
Croxton, A-4	Tour	2,500	4	27.25	121	36x4	36x4	Northeast	Elec Starter
Croxton, D-4	Road	2,250	2	27.25	121	36x4	36x4	Northeast	Elec Starter
Croxton, 10	Taxi	2,250		27.25	121	36x4	36x4	Northeast	Elec Starter
Dorris, H	Tour	2,500	5	30.63	121	36x4	36x4	Apico	Elec Starter
Dorris, H	Tour	2,550	7	30.63	121	36x4	36x4	Apico	Elec Starter
Dorris, H	Tour	2,500	4	30.63	121	36x4	36x4	Apico	Elec Starter
Dorris, H	Tour	2,550	6	30.60	121	36x4	36x4	Apico	Elec Starter
Duquesne, 50	Tour	2,500	5	36.10	124	36x4½	36x4½	Dynamo	Elec Starter
Duquesne, 50	Road	2,500	2	36.10	124	36x4½	36x4½	Dynamo	Elec Starter
Flanders, 50	Tour	2,200	4	38.40	130	36x4½	36x4½	Gray & Davis	Elec Starter
Flanders, 50	Tour	2,250	7	38.40	130	36x4½	36x4½	Gray & Davis	Elec Starter
Franklin, G	Tour	2,000	5	25.60	103	32x4	32x4		Air-Cooled
Franklin, M	Tour	2,900	5	31.60	116	34x4½	34x4½	Entz	Air-Cooled
Franklin, M	Run	2,800	2	31.60	116	34x4	34x4	Entz	Air-Cooled
Franklin, M	Phaeton	2,900	5	31.60	116	34x4½	34x4½	Entz	Air-Cooled
Garford, G-15	Road	2,750	2	33.75	128	36x4½	36x4½	U. S. L.	Elec Starter
Garford, G-15	Tour	2,750	5	33.75	128	36x4½	36x4½	U. S. L.	Elec Starter
Glide, 45	Road	2,000	2	36.10	120	36x4½	36x4½		Acet Starter
Glide, 45	Tour	2,000	4	36.10	120	36x4½	36x4½		Acet Starter
Glide, 45	Tour	2,150	5	36.10	120	36x4½	36x4½		Acet Starter
Glide, 45	Tour	2,250	7	36.10	120	36x4½	36x4½		Acet Starter
Great Southern, 51	Tour	2,100	6	43.90	128	36x4	36x4½	U. S. L.	Elec Starter
Great Western, 1913	Sedan	2,250	4	28.90	118	36x4	36x4	Storage Battery	Acet Starter
Grout, 35	Tour	2,000	5	32.40	116	34x4	35x4½	Ward-Leonard	Elec Starter
Grout, 35	Road	2,000	5	32.40	116	34x4	35x4½	Ward-Leonard	Elec Starter
Grout, 45	Tour	2,850	7	36.10	123	36x4	37x4½	Ward-Leonard	Elec Starter
Grout, 45	Tour	2,750	4	36.10	123	36x4	37x4½	Ward-Leonard	Elec Starter
Havers, 55	Road	2,250	2	38.40	128	36x4	36x4	Northeast	Elec Starter
Havers, 55	Tour	2,250	5	38.40	128	36x4	36x4	Northeast	Elec Starter
Haynes, 22	Tour	2,250	5	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Haynes, 22	Tour	2,250	4	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Haynes, 22	Road	2,250	2	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Haynes, 22	Coupe	2,750	3	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Holly, A	Tour	2,500	5	38.40	130	36x4½	36x4½	Ward-Leonard	Starter
Holly, A	Tour	2,500	7	38.40	130	36x4½	36x4½	Ward-Leonard	Starter
Hudson, 37	Coupe	2,350	3	27.25	118	36x4	36x4	Delco	Elec Starter
Hudson, 54	Tour	2,450	5	40.90	127	36x4½	36x4½	Delco	Elec Starter
Hudson, 54	Tour	2,450	5	40.90	127	36x4½	36x4½	Delco	Elec Starter
Hudson, 54	Road	2,450	2	40.90	127	36x4½	36x4½	Delco	Elec Starter
Hudson, 54	Tour	2,600	7	40.90	127	36x4½	36x4½	Delco	Elec Starter
Hudson, 54	Coupe	2,950	3	40.90	127	36x4½	36x4½	Delco	Elec Starter
Inter-State	Tour	2,750	5	38.40	132	36x4½	36x4½	Apico	Elec Starter
Jackson, Sultanic	Tour	2,500	5	40.90	138	36x4½	36x4½	Autolite	Elec Starter
Jackson, Sultanic	Tour	2,650	7	40.90	138	36x4½	36x4½	Autolite	Elec Starter
Keeton, Meadowbrook	Road	2,500	2	33.75	131	36x4	37x4½	Generator	Wire Wheels
Keeton, Riverside	Tour	2,500	5	33.75	131	36x4	37x4½	Generator	Wire Wheels
Keeton, Tuxedo	Coupe	2,850	2	33.75	131	36x4	37x4½	Generator	Wire Wheels
Kissel, 40	Tour	2,000	5	32.40	121	35x4½	35x4	Esterline	Elec Starter
Kissel, 50	Tour	2,500	6	38.00	132	36x4½	36x4½	Esterline	Elec Starter
Klinekar, 4-40	Tour	2,250	5	28.90	118	36x4	36x4	Rushmore	Mech Starter
Klinekar, 4-40	Tour	2,250	4	28.90	118	36x4	36x4	Rushmore	Mech Starter
Klinekar, 4-40	Run	2,250	2	28.90	118	36x4	36x4	Rushmore	Mech Starter
Klinekar, 4-40	Coupe	2,750	3	28.90	118	36x4	36x4	Rushmore	Mech Starter
Klinekar, 6-50	Tour	2,850	5	26.80	126	36x4½	36x4½	Rushmore	Mech Starter
Klinekar, 6-50	Tour	2,850	4	26.80	126	36x4½	36x4½	Rushmore	Mech Starter
Klinekar, 6-50	Run	2,650	2	26.80	126	36x4½	36x4½	Rushmore	Mech Starter
Klinekar, 6-50	Road	2,800	2	26.80	126	36x4½	36x4½	Rushmore	Mech Starter
Lenox, 40	Tour	2,000	5	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox, 40	Speedster	2,100	2	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox. 40	Road	2,000	2	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox, 40	Road	2,000	3	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox, 40	Road	2,000	4	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox, 40	Tour	2,000	4	28.90	118	34x4	34x4	Gray & Davis	Elec Starter
Lenox, Six	Tour	2,750	6	38.40	130	35x4½	35x4½	Gray & Davis	Elec Starter
Lenox, Six	Limousine		6	38.40	130	35x4½	35x4½	Gray & Davis	Elec Starter
Lexington, 13-6	Tour		5	40.90	129	36x4½	36x4½	Electro	Elec Starter

Types of Motor Starters

Electrical, Mechanical, Pneumatic, Acetylene and Other Kinds on Market

MOTOR starters as a whole may be divided into five major classes, viz.: electrical, acetylene, compressed air, gasoline, carbon dioxide and mechanical. The latter class takes into consideration lever, pedal and spring starters. The electrical starter consists usually of a generator, a battery and a motor. Sometimes the generator and motor are combined in one unit. The current from the battery is used to revolve the motor which is geared to the flywheel. After the engine has started, the current generated by the generator is used to charge the batteries.

The acetylene type of engine starter consists of a method of introducing into one or all of the cylinders a mixture of acetylene gas and air under pressure, from the lighting tank. This mixture takes the place of the normal gas mixture which is present when the motor is performing its natural functions.

Three things are essential in the compressed air type of starter; an air compressor, an air motor and a storage tank. In some cases the gas engine itself becomes the air motor by the introduction of compressed air in the cylinder heads,

ELECTRIC STARTERS

NAME	MAKER
Apico	Apple Electric Co.
Auto-Lite	Electric Auto Lite Co.
Deaco	Detroit Electric Appliance Co.
Disco	Ignition Starter Co.
Delco	Dayton Engineering Laboratories Co.
Electro	Electro Light & Starter Co.
Elgenac	Electric Generator & Accumul'tr Co.
Elyria-Dean	Dean Electric Co.
Entz	H. H. Franklin Co.
Esterline	Esterline Co.
Gray & Davis	Gray & Davis
Hartford	Hartford Suspension Co.
Jenny	Jenny Electric Starter Co.
Jones	Jones Electric Starter Co.
Leece-Neville	Leece-Neville Co.
Wagner	Wagner Electric Mfg. Co.
North East	North East Electric Co.
O'Neill	O'Neill Elec. Starter & Light Corp.
Otho	Dean Electric Co.
Paris	Paris Electric Starter Co.
Peru	Peru Auto Parts Mfg. Co.
Remy	Remy Electric Co.
Rushmore	Rushmore Dynamo Works
Strong	Strong Electric Co.
U. S. L.	U. S. Light & Heating Co.
Wagner	Wagner Elect. Mfg. Co.
Ward-Leonard	Ward-Leonard Co.
Warner	Warner Mfg. Co.
Westinghouse	Westing'hse Elect. & Mfg. Co.

ACETYLENE

A. A.	Auto Appliance Mfg. Co.
Acme	H. M. Sheer Co.
Acme	Auto Equipment Co.
American	Am. Starter & Carbureter Co.
Automatic	Automatic Motor Devices Co.
Blitzen	Blitzen Mfg. Co.
Crankless	Cox Brass Mfg. Co.
Crary	T. C. F. Mfg. Co.
Detroit	Auto Parts Mfg. Co.
Disco	Ignition Starter Co.
Dual	Dual Automatic Starter & Lighter Co.
Empire	Empire Starter Co.
E-Z	Mayer Auto Specialties Co.
E-Z	Auto Starter Co.
Eureka	Eureka Self Starter Co.
G. & S.	G. & S. Accessory Co.
Hanna	Hanna Starter Co.
Goodspeed	National Motor Starter Co.
Instantaneous	Instantaneous Auto Starter Co.
Invincible	Invincible Starter Co.
Leavitt	Leavitt Mfg. Co.
Magic	Magic Starter Co.
McLaren	National Motor Starter Co.
Meteor	Meteor Auto Tank Co.
Panwood	Panwood Mfg. Co.
Perkins	Perkins Appliance Co.
Prest-O	Prest-O-Lite Co.
Rekar	Rekar Automatic Starter Co.
Safety	G. & S. Accessory Co.

Burying the Hand-Crank

Names and Makers of all Starting Devices of Season Arranged According to Type

so that the pistons are driven downward by the pressure of the air above. A distributor is required in order to direct the air to the proper cylinder at the proper time in exactly the same way that the electric current is distributed to the different plugs.

The carbon dioxide starter is based upon the same principles as the compressed air starter, but in this case no compressor is needed. The compressed gas is obtained in the same form as the lighting gas—in a tank. The carbon dioxide gas under pressure is introduced into the cylinders in proper order. A peculiarity of this system is that no explosions can take place while the carbon dioxide is in the cylinder for this gas does not support combustion.

Mechanical starters make use of such devices as springs and levers. Energy is stored up in a spring and when released this spring is powerful enough to turn the motor over. After the motor is running it in turn tightens the spring which is ready to start the motor when necessary. Getting a long leverage on the flywheel is the secret of the lever starter.

NAME	MAKER
Shirley	A. F. Timme
Thompson	A. C. Thompson Automobile Co.
Troy	Troy Auto Specialty Co.
Unit	Unit Gas Starter Co.
Vim	Vim Mfg. Co.
Victor	Start-O Co.
Whitehouse	Whitehouse Mfg. Co.
MECHANICAL OR SPRING	
Bridges	C. E. Bridges
Duryea	Duryea Motor Co.
Elder	Elder Mfg. Co.
Ever Ready	American Ever Ready Co.
Gardner	Gardner Engine Starter Co.
Glenard	National Motor Device Co.
Keen	Keen Starter Co.
Mesnards	Modern Sales Bureau
Pull-Man	A. M. Walstrom
Regan	Regan Clutch Co.
Smith	A. O. Smith Co.
Star	Star Starter Co.
Volkmar	Volkmar Starter Co.
Warner	Warner Gear Co.
AIR	
English	Chevrolet Motor Co.
Compton	Melvin D. Compton
Crescent	Crescent Air System
Janney-Steinmetz	Janney-Steinmetz Co.
Merralls	Merralls Starter Co.
Meeder	H. L. Meeder
Never Miss	Wilson Motor Starting Co.
Prather Pneumatic	Pneumatic Clutch Co.
Simplex	Roth-Murphy Co.
Start-Lite	Start-Lite Co.
Thurber Turbine	Chalmers Motor Co., of Louisiana
Vance	Chgo-Racine Alum., Brass & Iron Wks.
PEDAL OR LEVER	
Columbia	Merle McFarland
National	National Gas Engine Co.
Neher	L. M. Neher
Simplex	Simplex Mfg. Co.
Triplex	Bremer-Wilson Mfg. Co.
Wilkinson	Wilkinson Motor Starter Co.
GASOLINE	
Gilson	Gilson Motor Starting Co.
*Geisler	Geisler Bros. Storage Battery Co.
Markham	W. D. Markham Co.
McIntyre	W. H. McIntyre Co.
*Page	H. & D. Mfg. Co.
Perfect	Bastian-Blessing Co.
Strickland	S. A. Strickland
Sure-Go	Motor Starting Co.
Wackenhuth	Frederick Wackenhuth

*Gas-Electric

CARBON-DIOXIDE

H. & M. Ham-Meix Mfg. Co.

BUYERS' GUIDE—$2,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Luverne, 76	Tour	2,850	7	43.80	130	37x5	37x5	Gray & Davis	Elec Starter
Marmon, 32	Road	2,900	2	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, 32	Speedster	2,850	2	32.40	120	35x4½	35x4½	Northeast	Elec Starter
McFarlan, S	Road	2,300	2	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, S	Tour	2,300	5	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, S	Tour	2,300	4	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, T	Road	2,500	2	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, T	Tour	2,500	4 & 5	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, T	Tour	2,550	6	38.40	124	37x4½	37x4½	Vesta System	Air Starter
McFarlan, M	Road	2,750	2	43.80	128	37x4½	37x4½	Vesta System	Air Starter
McFarlan, M	Tour	2,750	4 & 5	43.80	128	37x4½	37x4½	Vesta System	Air Starter
McFarlan, M	Tour	2,750	7	43.80	128	37x4½	37x4½	Vesta System	Air Starter
Mercer, J	Race	2,600	2	30.63	108	32x4	32x4	Generator	Elec Starter
Mercer, K	Run	2,700	2	30.63	108	32x4	32x4	Generator	Elec Starter
Mercer, G	Tour	2,900	4	32.40	118	34x4	34x4	Generator	Elec Starter
Mercer, H	Tour	2,900	5	32.40	118	34x4	34x4	Generator	Elec Starter
Midland, T-4	Coupe	2,350	3	32.40	121	34x4	34x4	Gray & Davis	Elec Starter
Midland, T-6	Road	2,385	2	38.40	134	36x4½	36x4½	Gray & Davis	Elec Starter
Midland, T-6	Tour	2,450	7	38.40	134	36x4½	36x4½	Gray & Davis	Elec Starter
Mitchell, 7-6	Tour	2,500	7	43.80	144	36x4½	36x4½	Esterline	Elec Starter
Moon, 65	Tour	2,500	5	38.40	132	36x4½	36x4½	Wagner	Elec Starter
Moon, 65	Tour	2,500	4	38.40	132	36x4½	36x4½	Wagner	Elec Starter
Moon, 65	Road	2,500	2	38.40	132	36x4½	36x4½	Wagner	Elec Starter
Moyer, D	Tour		5	38.40	122	35x4½	35x4½		Starter
Moyer, F	Phaeton		7	38.40	122	35x4½	35x4½		Starter
Moyer, B & E	Tour		5 & 7	32.40	117	34x4	34x4		Starter
Norwalk, A	Tour	2,750	5	38.40	127	38x4½	38x4½	Gray & Davis	Underslung
Norwalk, A	Road	2,750	2	38.40	127	38x4½	38x4½	Gray & Davis	Underslung
Nyberg, 60-T	Tour	2,200	5	43.80	138	36x4	36x4		Elec Starter
Nyberg, 60-T	Tour	2,300	7	43.80	138	36x4	36x4		Elec Starter
Nyberg, 60-R	Road	2,200	2	43.80	128	36x4	36x4		Elec Starter
Oakland, 42	Coupe	2,500	4	27.25	116	34x4	34x4	Deaco	Air Starter
Oakland, 6-60	Tour	2,400	7	40.90	130	34x4½	34x4½	Deaco	Air Starter
Oakland, 6-60	Tour	2,400	5	40.90	130	34x4½	34x4½	Deaco	Air Starter
Oakland, 6-60	Tour	2,400	4	40.90	130	34x4½	34x4½	Deaco	Air Starter
Oakland, 6-60	Speed	2,400	2	40.90	130	34x4½	34x4½	Deaco	Air Starter
Palmer-Sing., Six	Tour	2,000	5	38.40	127	36x4	36x4	Dynamo	Air Starter
Palmer-Sing., Six	Road	2,000	2	38.40	127	36x4	36x4	Dynamo	Air Starter
Pathfinder, 13	Coupe	2,500	3	27.25	120	36x4	36x4	Gray & Davis	Elec Starter
Pathfinder, 13	Cruiser	2,000	2	27.25	120	36x4	36x4	Gray & Davis	Wire Wheels
Pilot, 50	Tour	2,250	5	32.40	126	36x4	36x4		Elec Starter
Pilot, 60	Tour	2,500	5	38.40	132			Battery	Elec Starter
Pope-Hart., 31	Tour	2,250	5	30.10	118½	36x4½	36x4½	Dynamo	Elec Starter
Pope-Hart., 31	Phaeton	2,250	4	30.10	118½	36x4½	36x4½	Dynamo	Elec Starter
Pope-Hart., 31	Road	2,250	2	30.10	118½	36x4½	36x4½	Dynamo	Elec Starter
Pope-Hart., 31	Coupe	2,850	3	30.10	118½	36x4½	36x4½	Dynamo	Elec Starter
Pratt, 50	Tour	2,150	4	32.40	122	36x4	36x4	Gray & Davis	Elec Starter
Pratt, 50	Tour	2,150	5	32.40	122	36x4	36x4	Gray & Davis	Elec Starter
Pratt, 50	Tour	2,300	7	32.40	122	36x4	36x4	Gray & Davis	Elec Starter
Premier, 6-40	Tour	2,735	5	38.40	132	36x4½	36x4½	Dynamo	Air Starter
Premier, 6-40	Road	2,600	2	38.40	132	36x4½	36x4½	Dynamo	Air Starter
Pullman, 4-44	Tour	2,150	5	32.40	122	36x4	36x4	Vesta	Spring Starter
Pullman, 6-66	Tour	2,750	7	48.60	138	36x4	36x4	Vesta	Spring Starter
Rambler, Cross-C	Coupe	2,500	4	32.40	120	37x4½	37x4½	U. S. L.	Elec Starter
Rambler, Cross-C	Limousine	2,850	5	32.40	120	37x4½	37x4½	U. S. L.	Elec Starter
Rayfield, C	Tour	2,500	5	29.40	117	34x4	34x4		French Hood
Rayfield, C	Road	2,500	2	29.40	117	34x4	34x4		French Hood
Republic, D	Tour	2,350	5	28.90	120	36x4	36x4	Delco	
Republic, D	Tour	2,350	4	28.90	120	36x4	36x4	Delco	
Republic, D	Road	2,350	2	28.90	120	36x4	36x4	Delco	
Republic, E	Tour	2,950	5	43.80	132	36x4½	36x4½	Delco	Elec Starter
Schacht, NS	Tour	2,500	6	28.90	120	36x4	36x4		Elec Starter
Selden, 48	Tour	2,500	7	36.10	125	37x4½	37x4½	Gray & Davis	Acet Starter
Selden, 48	Tour	2,350	5	36.10	125	36x4	36x4	Gray & Davis	Acet Starter
Selden, 48	Tour	2,350	4	36.10	125	36x4	36x4	Gray & Davis	Acet Starter
Selden, 48	Road	2,350	2	36 10	125	36x4	36x4	Gray & Davis	Acet Starter
S. G. V., A	Run	2,500	2	22.50	116	34x4	34x4		
S. G. V., A	Tour	2,500	5	22.50	116	34x4	34x4		
Speedwell, G	Tour	2,850	4	40.90	134	36x4½	36x4½	Apico	Elec Starter
Speedwell, G	Tour	2,850	5	40.90	134	36x4½	36x4½	Apico	Elec Starter
Speedwell, G	Tour	2,950	7	40.90	134	36x4½	36x4½	Apico	Elec Starter
Speedwell, Rotary	Tour	2,850	4 & 5	40.90	134	36x4½	36x4½	Apico	Elec Starter
Spoerer, 25-A	Tour	2,000	5	27.25	120	35x4	35x4	Berdon	Elec Starter
Staver, 55	Tour	2,250	5	32.40	120	36x4	36x4	Generator	Air Starter
Staver, 55	Tour	2,400	4	32.40	124	36x4	36x4	Generator	Air Starter
Staver, 65	Tour	2,750	5	38.40	138	37x4½	37x4½	Generator	Air Starter
Staver, 65	Tour	2,750	7	38.40	138	37x4½	37x4½	Generator	Air Starter
Stoddard-Day, 38	Land	2,750		28.90	114	35x4½	35x4½		Acet Starter
Stoddard-Day., 38	Coupe	2,350		28.90	114	35x4½	35x4½		Acet Starter
Stoddard-Day., 48	Road	2,700		36.10	122½	36x4½	36x4½	Generator	
Stoddard-Day., 48	Tour	2,800		36.10	122½	36x4½	36x4½	Generator	
Studebaker, 35	Sedan	2,050	5	27.25	115½	34x4	34x4	Battery	Elec Starter
Studebaker, Six	Limousine	2,500	7	29.40	121	34x4	34x4	Battery	Elec Starter
Stutz, 4 Bearcat	Road	2,000	2	36.10	120	34x4½	34x4½	Esterline	W ire Whe ls

BUYERS' GUIDE—$2,500 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Stutz, 4 Tour	Tour	2,000	4	36.10	124	34x4½	34x4½	Esterline	Wire Wheels
Stutz, 4 Tour	Tour	2,050	6	36.10	124	34x4½	34x4½	Esterline	Wire Wheels
Stutz, 6 Bearcat	Road	2,250	2	43.80	124	34x4½	34x4½	Esterline	Wire Wheels
Stutz, 6 Tour	Tour	2,300	6	43.80	130	34x4½	34x4½	Esterline	Wire Wheels
Touraine, 7	Race	2,750	2	38.40	114	36x4	36x4		
Touraine, 7	Tour	2,950	7	38.40	133	36x4	36x4		
Touraine, 6	Runa	2,750	2	38.40	124	36x4	36x4		
Touraine, 6	Phaeton	2,750	5	38.40	124	36x4	36x4		
Touraine, 6	Tour	2,750	4	38.40	124	36x4	36x4		
Triumph, A	Run	2,250	2	36.10	114	36x4	36x4		Air Starter
Triumph, A	Road	2,250	3	36.10	114	36x4	36x4		Air Starter
Triumph, B	Tour	2,500	5	36.10	114	36x4	36x4		Air Starter
Velie, 40	Tour	2,000	5	32.40	118	36x4	36x4	Gray & Davis	Elec Starter
Velie, 40	Tour	2,000	4	32.40	118	36x4	36x4	Gray & Davis	Elec Starter
Warren, 50	Resolute	2,500	5	38.40	130	36x4½	36x4½	Northeast	Elec Starter
Westcott, 50	Tour	2,475	5	38.40	127	37x4½	37x4½		Starter
Westcott, 50	Tour	2,525	7	38.40	127	36x4½	37x4½		Starter
White, GRE	Tour	2,500	5	22.50	110	34x4	34x4	Own Make	Elec Starter
White, GRE	Road	2.500	2	22.50	110	34x4	34x4	Own Make	Elec Starter

$4,000 CLASS

Abbott-Detroit, E	Limousine	3,050	7	32.40	121	36x4½	36x4½	Autolite	Elec Starter
Adams-Farwell, 9	Road	3,000	5	60.50	120	36x4½	36x4½		Revolv'g Motor
Adams-Farwell, 9	Tour	3,500	7	60.50	120	36x4½	36x4½		Revolv'g Motor
A. E. C., 6-60	Road	3,000	2	48.60	138	37x5	37x5	Battery	Elec Starter
A. E. C., 6-60	Tour	3,000	7	48.60	138	37x5	37x5	Battery	Elec Starter
Alco, 7-16	Land	6,750	6	24.90	104	32x4	32x4		
Alco, 11-60	Tour	6,000	7	54.10	133½	36x4½	37x5	Gray & Davis	
Alco, 11-60	Tour	6,000	5	54.10	133½	36x4½	37x5	Gray & Davis	
Alco, 11-60	Limousine	6,750	5	54.10	133½	36x4½	37x5	Gray & Davis	
Alco, 11-60	Berl	7,250	7	54.10	133½	36x4½	37x5	Gray & Davis	
American, Trav., 54A	Tour	4,250	4	46.00	124	40x4	41x4½	Generator	Underslung
American Trav., 65A	Tour	4,500	6	46.00	140	41x4½	41x4½	Generator	Underslung
Amplex, F	Tour		5	40.90	130	36x4½	36x4½	Northeast	Elec Starter
Amplex, F	Road		2	40.90	130	36x4½	36x4½	Northeast	Elec Starter
Atlas, 12	Tour	3,500	5	32.40	130	37x5	37x5	Deaco	Knight Motor
Atlas, 12	Tour	3,700	7	32.40	130	37x5	37x5	Deaco	Knight Motor
Auburn, 6-50	Tour	3,000	7	40.90	135	37x4½	37x4½	Ward-Leonard	
Austin, 55	Tour	4,000	4 & 5	38.40	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 55	Tour	4,000	7	38.40	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 55	Limousine	5,000	7	38.40	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 66	Tour	5,000	4 & 5	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 66	Tour	5,000	7	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 66	Limousine	6,000	7	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 77	Tour	6,000	4 & 5	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 77	Tour	6,000	7	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 77	Tour	6,150	9	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Austin, 77	Limousine	7,000	7	48.60	141	37x5	37x5	Leece-Neville	Air Starter
Bergdoll, 40	Limousine	3,250	7	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Bergdoll, 40	Coupe	3,250	4	25.60	121	36x4	36x4	U. S. L.	Elec Starter
Cadillac, 1913	Limousine	3,250	7	32.40	120	36x4½	36x4½	Delco	Elec Starter
Carroll, 4D	Road	3,000	2 & 3	40.00	128	36x4½	36x4½	Aplco	Spring Starter
Carroll, 4D	Tour	3,250	4 & 5	40.00	128	36x4½	36x4½	Aplco	Spring Starter
Carroll, 4D	Tour	3,300	6 & 7	40.00	128	36x4½	36x4½	Aplco	Spring Starter
Carroll, 6C	Road	3,250	2 & 3	40.90	128	36x4½	36x4½	Aplco	Spring Starter
Carroll, 6C	Tour	3,500	4 & 5	40.90	128	36x4½	36x4½	Aplco	Spring Starter
Carroll, 6C	Tour	3,500	6 & 7	40.90	128	36x4½	36x4½	Aplco	Spring Starter
Chadwick, 19	Tour	5 500	5 & 7	60.00	133	36x4½	37x5	Gray & Davis	Starter
Chadwick, 19	Limousine	6,500	7	60.00	133	36x4½	37x5	Gray & Davis	Starter
Chadwick, 19	Road	5,500	2 & 3	60.00	112	36x4½	36x4½	Gray & Davis	Starter
Chalmers, 17	Limousine	3,250	7	28.90	118	37x4½	37x4½	Gray & Davis	Air Starter
Chalmers, 18	Limousine	3,700	7	43.80	130	37x5	37x5	Gray & Davis	Air Starter
Cole, 50	Limousine	3,250	4	32.40	122	36x4	36x4	Delco	Elec Starter
Cole, 60	Coupe	3,000	4	40.90	132	37x4½	37x4½	Delco	Elec Starter
Cole, 60	Limousine	3,750	7	40.90	132	37x4½	37x4½	Delco	Elec Starter
Columbia, 88	Road	4,500	2	38.00	129	36x4½	36x4½	Gray & Davis	Knight Motor
Columbia, 88	Tour	4,500	4 & 7	38.00	129	36x4½	36x4½	Gray & Davis	Knight Motor
Columbia, 88	Limousine	5,800	7	38.00	129	36x4½	36x4½	Gray & Davis	Knight Motor
Columbia, 88	Land	5,800	7	38.00	129	36x4½	36x4½	Gray & Davis	Knight Motor
Columbia, 88	Tour	4,500	6	38.00	129	36x4½	36x4½	Gray & Davis	Knight Motor
Columbia, 85-2	Road	3,300	2 & 4	38.00	120	36x4½	36x4½	Battery	
Columbia, 85-2	Tour	3,400	6	38.00	120	36x4½	36x4½	Battery	
Columbia, 85-2	Tour	3,500	7	38.00	120	36x4½	36x4½	Battery	
Columbia, 85-2	Limousine	4,800	7	38.00	120	36x4½	36x4½	Battery	
Croxton, B-6	Tour	3,000	6	28.90	138	36x4½	36x4½	Northeast	Elec Starter
Cunningham, M	Tour	3,500	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Cunningham, M	Phaeton	3,500	5	36.10	124	36x4½	36x4½	Generator	Elec Starter
Cunningham, M	Limousine	4,500	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Cunningham, M	Land	4,500	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Cunningham, M	Road	3,250	3	36.10	124	36x4½	36x4½	Generator	Elec Starter
Diamond, T	Opt	3,500	—	40.00	126	36x4½	36x4½		Bodies to Order
Duquesne, 50	Tour	3,000	4 & 5	33.75	133	36x4½	36x4½	Generator	Elec Starter
Duquesne, 50	Road	3,000	2 & 3	33.75	133	36x4½	36x4½	Generator	Elec Starter
Edwards, 25	Tour	3,500	4 & 5	25.60	120	36x4½	36x4½	U. S. L.	Knight Motor

New Stroke-Bore Ratios

Relation of Piston Travel to Cylinder Diameter Told in Tabular Figures

IN the table on these pages is presented a list of all the motors on the 1913 American market, arranged according to their stroke-bore ratios. By the term stroke-bore ratio is meant the relation of the stroke of the piston in inches to the bore or diameter of the cylinder in inches, with the bore considered as 1. It is found by dividing the stroke by the bore. In

BORE AND STROKE OF 1913 MOTORS

Name and Model	Number Cylinders	Bore and Stroke Inches	Ratio Stroke to Bore
Only	4	4.25x7.88	1.86 to 1
Hupmobile, H	4	3.25x5.50	1.69 to 1
Mitchell, 5-4	4	4.25x7.00	1.65 to 1
Mitchell, 7-6	6	4.25x7.00	1.65 to 1
Lambert, Buckeye	4	3.25x5.25	1.62 to 1
Nyberg, 645	6	3.75x6.00	1.60 to 1
Mitchell, 5-6	6	3.75x6.00	1.60 to 1
Garford, G15	6	3.75x6.00	1.60 to 1
Rayfield	6	3.50x5.50	1.57 to 1
Austin, 66	6	4.50x7.00	1.56 to 1
R. C. H.	4	3.25x5.00	1.54 to 1
Lozier, 77	6	3.63x5.50	1.52 to 1
Staver, 65	6	4.00x6.00	1.50 to 1
McFarlan, T	6	4.00x6.00	1.50 to 1
Westcott, 50	6	4.00x6.00	1.50 to 1
Correja, R & S	6	4.00x6.00	1.50 to 1
Cino, 660	6	4.00x6.00	1.50 to 1
Pilot, 60	6	4.00x6.00	1.50 to 1
Bergdoll, 40	4	4.00x5.94	1.49 to 1
Duquesne, Six	6	3.75x5.50	1.47 to 1
A. E. C., 6-45	6	3.75x5.50	1.47 to 1
Velie, 32	4	3.75x5.50	1.47 to 1
Keeton, 48	6	3.75x5.50	1.47 to 1
Moline, M-40	4	4.13x6.00	1.45 to 1
Moon, 65	6	4.00x5.75	1.44 to 1
Moon, 39	4	4.00x5.75	1.44 to 1
Correja, C & J	6	3.50x5.00	1.43 to 1
Studebaker, Six	6	3.50x5.00	1.43 to 1
Oakland, 35	4	3.50x5.00	1.43 to 1
Studebaker, 25	4	3.50x5.00	1.43 to 1
Dispatch, G-2	4	3.50x5.00	1.43 to 1
Lion, 30	4	3.50x5.00	1.43 to 1
Crane, 3	6	4.38x6.25	1.43 to 1
Chevrolet	6	3.55x5.00	1.41 to 1
Pierce-Arrow, 66	6	5.00x7.00	1.40 to 1
Nyberg, 437	4	3.75x5.25	1.40 to 1
Alpena, N-50	6	3.75x5.25	1.40 to 1
Alpena, P-40	4	3.75x5.25	1.40 to 1
Auburn, 33L	4	3.75x5.25	1.40 to 1
Halladay, 32	4	3.75x5.25	1.40 to 1
Detroiter, A	4	3.38x4.75	1.40 to 1
Burg, S	6	3.75x5.25	1.40 to 1
Auburn, 6-45	6	3.75x5.25	1.40 to 1
Peerless, 37	6	5.00x7.00	1.40 to 1
Packard, 38	6	4.00x5.50	1.38 to 1
Crow-Elkhart, C2-3-4, DT	4	4.00x4.50	1.38 to 1
Edwards	4	4.00x5.50	1.38 to 1
King, Touring	4	4.00x5.50	1.37 to 1
Mason, K	4	4.00x4.50	1.37 to 1
White, GRE	4	3.75x5.13	1.37 to 1
Flat, 54	4	4.40x6.00	1.37 to 1
Flat, 56	6	4.40x6.00	1.37 to 1
Stoddard-Day, 30	4	4.00x4.50	1.37 to 1
Peerless, 35	6	4.00x5.50	1.37 to 1
Stearns, Knight, 6	6	4.25x5.75	1.36 to 1
White, GEB	4	4.25x5.75	1.35 to 1
White, GF	6	4.25x5.75	1.35 to 1
Havers, 44	6	3.75x5.00	1.34 to 1
Simplex, 127	4	4.88x6.50	1.34 to 1
King, Roadster	4	3.83x5.13	1.34 to 1
Marion, 48A	4	4.13x5.50	1.33 to 1
Arbenz, F. G. H.	4	4.13x5.50	1.33 to 1
Zimmerman, Z6	6	3.75x5.00	1.33 to 1
Peerless, 36	6	4.50x6.00	1.33 to 1
Pilot, 50	4	4.50x6.00	1.33 to 1
Staver, 55	4	4.50x6.00	1.33 to 1
Marmon, Six	6	4.50x6.00	1.33 to 1
Herreshoff, 4	4	3.38x4.50	1.33 to 1
Herreshoff, 6	6	3.38x4.50	1.33 to 1
Cino, 450	4	4.50x6.00	1.33 to 1
American Scout, 22	4	3.75x5.00	1.33 to 1
Hudson, 54	6	4.13x5.50	1.33 to 1
Flat, 55	4	5.13x6.75	1.32 to 1
S. G. V. D.	4	4.00x5.25	1.31 to 1
Touraine	6	4.00x5.25	1.31 to 1
Great Western	4	4.25x5.50	1.30 to 1
Lenox, Four	4	4.25x5.50	1.30 to 1
Klinekar, 60	6	4.25x5.50	1.30 to 1
Klinekar, 40	4	4.25x5.50	1.30 to 1
Spaulding, G	4	4.25x5.50	1.30 to 1
Stearns, Knight 4	4	4.25x5.50	1.30 to 1

Only Car Leads List

American Motors Arranged on Long-Stroke Basis—Few Square Designs

the tables those motors with the greater stroke-bore ratio are given first. For instance, it will be noticed that the Only car, with its bore of 4¼ and stroke of 7⅞ inches, has the greatest ratio of the 1913 cars. That is, if we divide 7⅞ by 4¼ we will get 1.86, so that the stroke-bore ratio of the Only car is 1.86 to 1. Square motors have bore and stroke the same.

BORE AND STROKE MOTORS—Continued

Name and Model	Number Cylinders	Bore and Stroke Inches	Ratio Stroke to Bore
Croxton, B6	6	4.25x5.50	1.30 to 1
Marathon Runner	4	3.50x4.50	1.29 to 1
McIntyre	6	3.50x4.50	1.29 to 1
Empire	4	3.50x4.50	1.29 to 1
Schacht, NS, KL	4	4.25x5.50	1.29 to 1
Cadillac	4	4.50x5.75	1.28 to 1
Pratt, 50	4	4.50x5.75	1.28 to 1
Lexington, 13	6	4.13x5.25	1.27 to 1
Pathfinder	4	4.13x5.25	1.27 to 1
Glide, 36-42	4	4.13x5.25	1.27 to 1
Carroll, 6C	6	4.13x5.25	1.27 to 1
Colby, C 6-60	6	4.13x5.25	1.27 to 1
Speedwell, G	6	4.13x5.25	1.27 to 1
Great Eagle, C	6	4.13x5.25	1.27 to 1
Hudson, 37	4	4.13x5.25	1.27 to 1
Colby, C	4	4.13x5.25	1.27 to 1
Stevens-Duryea	6	4.32x5.50	1.27 to 1
Abbott-Detroit, D	4	4.13x5.25	1.27 to 1
Firestone-Col. 86E	4	4.13x5.25	1.27 to 1
Henderson	4	4.13x5.25	1.27 to 1
Davis, 40	4	4.13x5.25	1.27 to 1
Firestone-Col., 90	6	4.13x5.25	1.27 to 1
Falcar	4	4.13x5.25	1.27 to 1
Crawford, 13-30	4	4.13x5.25	1.27 to 1
Crow-Elkhart, C-6A	6	4.13x5.25	1.27 to 1
Ames, 44 and 45	4	4.13x5.25	1.27 to 1
Amplex	6	4.13x5.25	1.27 to 1
Burg, R	6	4.13x5.25	1.27 to 1
Auburn, 6-50	6	4.13x5.25	1.27 to 1
Case, N	4	4.13x5.25	1.27 to 1
Knox, 46	6	4.38x5.50	1.26 to 1
Moyer, D & F	6	4.00x5.00	1.25 to 1
Havers, 55	6	4.00x5.00	1.25 to 1
Marion, 36A and 37A	4	4.00x5.00	1.25 to 1
Austin, 55	6	4.00x5.00	1.25 to 1
Holly	6	4.00x5.00	1.25 to 1
Warren, Resolute	6	4.00x5.00	1.25 to 1
Pope-Hartford, 29	6	4.32x5.38	1.25 to 1
Pierce-Aroow, 38	6	4.00x5.00	1.25 to 1
Coey	6	4.00x5.00	1.25 to 1
Norwalk, A	6	4.00x5.00	1.25 to 1
McFarlan, S	6	4.00x5.00	1.25 to 1
Midland, T-6	6	4.00x5.00	1.25 to 1
Miller, 40	4	4.13x5.15	1.25 to 1
Regal, C	6	4.00x5.00	1.25 to 1
Cutting, 40	4	4.00x5.00	1.25 to 1
Lenox, Six	6	4.00x5.00	1.25 to 1
Paige, 36	4	4.00x5.00	1.25 to 1
Palmer-Singer, Brighton	6	4.00x5.00	1.25 to 1
Interstate, 45	6	4.00x5.00	1.25 to 1
Premier, 6-40	6	4.00x5.00	1.25 to 1
Chalmers	4	4.25x5.25	1.24 to 1
Chalmers	6	4.25x5.25	1.24 to 1
Luverne, 760	6	4.25x5.25	1.24 to 1
Lambert, 99	4	4.25x5.25	1.24 to 1
Nyberg, 660	6	4.25x5.25	1.24 to 1
Garford, 14	6	4.25x5.25	1.24 to 1
Flanders, 40	6	3.63x4.50	1.24 to 1
Nyberg, 440	4	4.25x5.25	1.24 to 1
Maxwell, 10	4	4.25x5.25	1.23 to 1
Pullman, 36	4	4.06x5.00	1.23 to 1
National	4	4.88x6.00	1.23 to 1
Crow-Elkhart, C-6B	6	3.75x5.00	1.23 to 1
Croxton, A	4	4.13x5.50	1.23 to 1
Michigan, R & S	4	4.25x5.25	1.23 to 1
Stoddard-Day, Knight	6	4.50x5.50	1.22 to 1
Norwalk, B	6	4.50x5.50	1.22 to 1
Firestone-Col., 60	4	4.50x5.50	1.22 to 1
Atlas, 12	4	4.50x5.50	1.22 to 1
Abbott-Detroit, E	4	4.50x5.50	1.22 to 1
Matheson, C	6	4.50x5.00	1.22 to 1
Pullman, 44	4	4.50x5.50	1.22 to 1
Pullman, 66	6	4.50x5.50	1.22 to 1
Carhartt, B	4	4.50x5.50	1.22 to 1
Pierce-Arrow, 48	6	4.50x5.50	1.22 to 1
Colby, E	4	4.50x5.50	1.22 to 1
Davis, 50	4	4.50x5.50	1.22 to 1
Crawford, 13-40	4	4.50x5.50	1.22 to 1
Locomobile, M	6	4.50x5.50	1.22 to 1
Haynes, 22	4	4.50x5.50	1.22 to 1
Kilnekar, 50	6	4.10x5.00	1.22 to 1

BUYERS' GUIDE—$4,000 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL-BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Edwards, 25	Road	$3,500	2	25.60	120	36x4½	36x4½	U. S. L.	Knight Motor
Edwards, 25	Limousine	4,600	7	25.60	120	36x4½	36x4½	U. S. L.	Knight Motor
Edwards, 25	Land	4,700	7	25.60	120	36x4½	36x4½	U. S. L.	Knight Motor
Fiat, 54	Phaeton	4,000	5	31.10	123	36x4½	36x4½	Gray & Davis	Italian Design
Fiat, 54	Tour	4,000	7	31.10	123	36x4½	36x4½	Gray & Davis	Italian Design
Fiat, 54	Run	4,000	4	31.10	123	36x4½	36x4½	Gray & Davis	Italian Design
Fiat, 54	Limousine	5,000	7	31.10	123	36x4½	36x4½	Gray & Davis	Italian Design
Fiat, 54	Land	5,100	7	31.10	123	36x4½	36x4½	Gray & Davis	Italian Design
Fiat, 56	Phaeton	5,000	5	46.65	135	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 56	Tour	5,000	7	46.65	135	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 56	Run	5,000	4	46.65	135	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 56	Limousine	6,000	7	46.65	135	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 56	Land	6,100	7	46.65	135	36x4½	36x5	Gray & Davis	Italian Design
Fiat, 55	Phaeton	4,500	5	42.00	128	36x4½	37x5	Gray & Davis	Italian Design
Fiat 55	Tour	4,500	7	42.00	128	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 55	Road	4,500	4	42.00	128	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 55	Limousine	5,500	7	42.00	128	36x4½	37x5	Gray & Davis	Italian Design
Fiat, 55	Land	5,600	7	42.00	128	36x4½	37x5	Gray & Davis	Italian Design
Firestone-Col. 90E	Tour		5	40.90	130	36x4½	36x4½	Northeast	Elec Starter
Firestone-Col. 90E	Tour		7	40.90	130	36x4½	36x4½	Northeast	Elec Starter
Firestone-Col., 86-E	Road		5	27.25	116	34x4	34x4	Northeast	Elec Starter
Firestone-Col., 86-E	Tour		3	27.25	116	34x4	34x4	Northeast	Elec Starter
Firestone-Col., 60-E	Tour		5	32.40	122	36x4	36x4	Northeast	Elec Starter
Firestone-Col., 60-E	Tour		7	32.40	122	36x4	36x4	Northeast	Elec Starter
Firestone-Col., 60-E	Limousine		7	32.40	122	32x4	36x4	Northeast	Elec Starter
Franklin, D	Tour	3,600	5	38.40	123	36x4½	37x5	Battery	Elec Starter
Franklin, H	Tour	4,750	7	38.40	126	37x5	37x5	Battery	Elec Starter
Franklin, H	Limousine	4,850	7	38.40	126	37x5	37x5	Battery	Elec Starter
Garford, G-14	Run	4,500	5 & 7	43.80	139	37x5	37x5	Dynalux	
Garford, G-14	Tour	4,500	5 & 7	43.80	139	37x5	37x5	Dynalux	
Garford, G-14	Limousine	5,650	7	43.80	139	37x5	37x5	Dynalux	
Garford, G-14	Land	5,750	7	43.80	139	37x5	37x5	Dynalux	
Great Eagle, B	Tour	3,500	7	36.10	135	36x4½	36x4½		
Great Eagle, B	Limousine	4,000	7	36.10	135	36x4½	36x4½		
Great Eagle, B	Limousine	4,750	10	36.10	135	36x4½	36x4½		
Great Eagle, B	Land	3,500	7	36.10	135	36x4½	36x4½		
Great Eagle, C	Tour	4,000	7	40.90	142	37x5	37x5		
Great Eagle, C	Limousine	4,500	7	40.90	142	37x5	37x5		
Great Eagle, C	Limousine	5,250	10	40.90	142	37x5	37x5		
Great Eagle, C	Land	4,000	7	40.90	142	37x5	37x5		
Haynes, 22	Limousine	3,400	7	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Haynes, 22	Berl	3,500	7	32.40	120	36x4½	36x4½	Leece-Neville	Elec Starter
Hudson, 37	Limousine	3,250	7	27.25	118	36x4	36x4	Delco	Elec Starter
Hudson, 54	Limousine	3,750	7	40.90	127	36x4½	36x4½	Delco	Elec Starter
Kissel, 60	Tour	3,150	6	48.60	140	37x5	37x5	Esterline	Elec Starter
Kissel, 60	Tour	3,150	7	48.60	140	37x5	37x5	Esterline	Elec Starter
Klinekar, 4-40	Limousine	3,750	7	28.90	118	36x4	36x4	Rushmore	Mech Starter
Klinekar, 6-50	Limousine	4,350	7	40.70	126	36x4½	36x4½	Rushmore	Mech Starter
Klinekar, 6-50	Coupe	3,150	3	40.70	126	36x4½	36x4½	Rushmore	Mech Starter
Klinekar, 6-60	Tour	3,500	6 & 7	43.80	132	37x5	37x5	Rushmore	Mech Starter
Klinekar, 6-60	Phaeton	3,500	4	43.80	132	37x5	37x5	Rushmore	Mech Starter
Klinekar, 6-60	Run	3,250	2	43.80	132	37x5	37x5	Rushmore	Mech Starter
Klinekar, 6-60	Coupe	3,750	3	43.80	132	37x5	37x5	Rushmore	Mech Starter
Klinekar, 6-60	Limousine	5,000	7	43.80	132	37x5	37x5	Rushmore	Mech Starter
Klinekar, 6-60	Meteor	3,200	2	43.80	132	37x5	37x5	Rushmore	Mech Starter
Knox, 44	Run	3,350	2	40.00	122	36x4½	36x4½		Acet Starter
Knox, 44	Tour	3,400	4	40.00	122	36x4½	36x4½		Acet Starter
Knox, 44	Run	3,350	4	40.00	122	36x4½	36x4½		Acet Starter
Knox, 44	Tour	3,450	5	40.00	122	36x4½	36x4½		Acet Starter
Knox, 44	Tour	3,500	7	40.00	122	36x4½	36x4½		Acet Starter
Knox, 45	Tour	3,700	6	40.00	126	37x5	37x5		Acet Starter
Knox, 45	Tour	3,800	7	40.00	126	37x5	37x5		Acet Starter
Knox, 45	Limousine	4,700	7	40.00	126	37x5	37x5		Acet Starter
Knox, 45	Land	4,750	7	40.00	126	37x5	37x5		Acet Starter
Knox, 46	Tour	4,350	6 & 7	45.96	134	38x5	38x5	Berdon	Acet Starter
Knox, 46	Run	4,350	2	45.96	134	38x5	38x5	Berdon	Acet Starter
Knox, 46	Limousine	5,350	7	45.96	134	38x5	38x5	Berdon	Acet Starter
Knox, 46	Land	5,400	7	45.96	134	38x5	38x5	Berdon	Acet Starter
Knox, 46	Run	4,350	4	45.96	134	38x5	38x5	Berdon	Acet Starter
Knox, 66	Tour	5,000	6 & 7	60.00	134	38x5½	38x5½	Berdon	Acet Starter
Knox, 66	Run	4,800	2 & 4	60.00	134	38x5½	38x5½	Berdon	Acet Starter
Knox, 66	Limousine	6,400	7	60.00	134	38x5½	38x5½	Berdon	Acet Starter
Knox, 66	Land	6,400	7	60.00	134	38x5½	38x5½	Berdon	Acet Starter
Locomobile, L	Tour	3,600	4 & 5	32.40	120	34x4½	34x4½	Adlake	Acet Starter
Locomobile, L	Roadster	3,600	2	32.40	120	34x4½	34x4½	Adlake	Acet Starter
Locomobile, R	Tour	4,300	5	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, R	Tour	4,300	4	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, R	Road	4,300	2	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, R	Limousine	5,350	7	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, R	Berline	5,500	7	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, R	Land	5,650	7	43.80	128	36x4½	36x4½	Adlake	Acet Starter
Locomobile, M	Tour	5,000	7	48.60	136	36x4½	37x5	Adlake	Acet Starter
Locomobile, M	Tour	5,000	5	48.60	136	36x4½	37x5	Adlake	Acet Starter
Locomobile, M	Road	5,000	2	48.60	136	36x4½	37x5	Adlake	Acet Starter
Locomobile, M	Limousine	6,000	7	48.60	136	36x4½	37x5	Adlake	Acet Starter
Locomobile, M	Land	6,100	7	48.60	136	36x4½	37x5	Adlake	Acet Starter
Lozier, 77	Tour	3,250	5	31.60	127½	36x4½	36x4½	Gray & Davis	Elec Starter
Lozier, 77	Coupe	3,850	3	31.60	127½	36x4½	36x4½	Gray & Davis	Elec Starter
Lozier, 77	Road	3,250	3	31.60	127½	36x4½	36x4½	Gray & Davis	Elec Starter
Lozier, 77	Limousine	4,450	6	31.60	127½	36x4½	36x4½	Gray & Davis	Elec Starter
Lozier, 77	Limousine	4,450	5	31.60	127½	36x4½	36x4½	Gray & Davis	Elec Starter
Lozier, 72	Tour	5,000	7	51.60	131	36x4½	37x5	Gray & Davis	
Lozier, 72	Limousine	6,500	7	51.60	131	36x4½	37x5	Gray & Davis	
Lozier, 72	Tour	5,000	5	51.60	131	36x4½	37x5	Gray & Davis	
Lozier, 72	Land	6,500	7	51.60	131	36x4½	37x5	Gray & Davis	
Lozier, 72	Road	5,000	2	51.60	131	36x4½	37x5	Gray & Davis	
Marmon, 32	Tour	3,000	5	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, 32	Tour	3,125	7	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, 32	Tour	3,000	4	32.40	120	35x4½	35x4½	Northeast	Elec Starter

BUYERS GUIDE—$4,000 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Marmon, 32	Limousine	4,000	7	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, 32	Land	4,100	7	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, 32	Coupe	3,700	4	32.40	120	35x4½	35x4½	Northeast	Elec Starter
Marmon, Six	Tour	5,000	7	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Tour	5,000	5	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Tour	5,000	4	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Road	5,000	2	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Limousine	6,250	7	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Ber	6,450	7	48.60	145	36x4½	37x5	Northeast	Elec Starter
Marmon, Six	Land	6,350	7	48.60	145	36x4½	37x5	Northeast	Elec Starter
Matheson, C	Tour	4,800	7	48.60	135	37x5	37x5	Westinghouse	Elec Starter
Matheson, C	Tour	4,800	5	48.60	135	37x5	37x5	Westinghouse	Elec Starter
McFarlan, S	Coupe	3,100	2	38.40	124	37x4½	37x4½	Vesta	Air Starter
McFarlan, S	Coupe	3,300	4	38.40	124	37x4½	37x4½	Vesta	Air Starter
McFarlan, T	Coupe	3,300	2	38.40	124	37x4½	37x4½	Vesta	Air Starter
McFarlan, T	Coupe	3,300	4	38.40	124	37x4½	37x4½	Vesta	Air Starter
McFarlan, T	Limousine	3,700	7	38.40	124	37x4½	37x4½	Vesta	Air Starter
McFarlan, M	Limousine	4,050	7	38.40	124	37x4½	37x4½	Vesta	Air Starter
Midland, T-4	Sedan	3,250	5	32.40	121	34x4	34x4	Gray & Davis	Elec Starter
Morse, 34	Tour	4,200	5	34.25	127	36x4½	36x4½	Gray & Davis	Starter
Morse, 34	Road	4,200	2	34.25	127	36x4½	36x4½	Gray & Davis	Starter
Morse, 34	Limousine	5,400	5	34.25	127	36x4½	36x4½	Gray & Davis	Starter
Morse, 34	Tour	4,200	4	34.25	127	36x4½	36x4½	Gray & Davis	Starter
National, V	Tour	3,300	5	38.00	128	36x4½	36x4½	Gray & Davis	Elec Starter
National, V	Tour	3,300	4	38.00	128	36x4½	36x4½	Gray & Davis	Elec Starter
National, V	Tour	3,400	7	38.00	128	36x5	36x5	Gray & Davis	Elec Starter
National, V	Limousine	4,800	7	38.00	128	36x5	36x5	Gray & Davis	Elec Starter
National, V	Road	3,150	2	38.00	120	34x4½	34x4½	Gray & Davis	Elec Starter
Norwalk, A	Tour	3,000	4	38.40	136	40x4½	40x4½	Gray & Davis	Underslung
Norwalk, A	Tour	3,100	6	38.40	136	40x4½	40x4½	Gray & Davis	Underslung
Norwalk, B	Tour	3,850	4	43.80	144	41x5	41x5		Underslung
Norwalk, B	Tour	3,750	6	43.80	144	41x5	41x5		Underslung
Oldsmobile, 53	Road	3,200	2	40.90	135	36x4½	36x4½	Generator	Elec Starter
Oldsmobile, 53	Tour	3,350	4	40.90	135	36x4½	36x4½	Generator	Elec Starter
Oldsmobile, 53	Tour	4,800	5	40.90	135	36x4½	36x4½	Generator	Elec Starter
Oldsmobile, 53	Tour	5,000	7	40.90	135	36x4½	36x4½	Generator	Elec Starter
Oldsmobile, 53	Limousine	6,500	7	40.90	135	36x4½	36x4½	Generator	Elec Starter
Packard, 38	Run	4,050	3	38.40	115½	36x4½	37x5	Generator	Elec Starter
Packard, 38	Coupè	4,500	3	38.40	115½	36x4½	37x5	Generator	Elec Starter
Packard, 38	Coupe	4,900	5	38.40	115½	36x4½	37x5	Generator	Elec Starter
Packard, 38	Tour	4,150	5	38.40	134	36x4½	37x5	Generator	Elec Starter
Packard, 38	Limousine	5,200	7	38.40	134	36x4½	37x5	Generator	Elec Starter
Packard, 38	Land	5,300	7	38.40	134	36x4½	37x5	Generator	Elec Starter
Packard, 38	Limousine	5,400	7	38.40	134	36x4½	37x5	Generator	Elec Starter
Packard, 38	Phaeton	4,150	5	38.40	138	36x4½	37x5	Generator	Elec Starter
Packard, 38	Phaeton	4,150	4	38.40	138	36x4½	37x5	Generator	Elec Starter
Packard, 38	Broug	5,200	5	38.40	138	36x4½	37x5	Generator	Elec Starter
Packard, 48	Run	4,650	3	48.60	121½	36x4½	37x5	Generator	Water Governor
Packard, 48	Coupe	5,100	3	48.60	121½	36x4½	37x5	Generator	Water Governor
Packard, 48	Tour	4,850	7	48.60	139	36x4½	37x5	Generator	Water Governor
Packard, 48	Limousine	5,850	7	48.60	139	36x4½	37x5	Generator	Water Governor
Packard, 48	Land	5,950	7	48.60	139	36x4½	37x5	Generator	Water Governor
Packard, 48	Limousine	6,050	7	48.60	139	36x4½	37x5	Generator	Water Governor
Packard, 48	Phaeton	4,750	5	48.60	139	36x4½	37x5	Generator	Water Governor
Packard, 48	Broug	5,800	5	48.60	139	36x4½	37x5	Generator	Water Governor
Palmer-Sing., 64	Tour	3,200	7	57.00	138	36x4	36x5	Dyneto	Air Starter
Palmer-Sing., 64	Tour	3,000	5	57.00	138	36x4	36x5	Dyneto	Air Starter
Palmer-Sing., 64	Road	3,000	2	57.00	138	36x4	36x5	Dyneto	Air Starter
Peerless, 29	Limousine	4,200	6	25.00	113	34x4½	34x4½	Battery	Governor
Peerless, 29	Land	4,300	6	25.60	113	34x4½	34x4½	Battery	Governor
Peerless, 35	Tour	4,300	5	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Tour	4,300	4	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Road	4,300	3	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Limousine	5,300	7	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Land	5,400	7	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Limousine	5,500	7	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 35	Coupe	5,000	3	38.40	125	36x4½	36x4½	Gray & Davis	Elec Starter
Peerless, 36	Tour	5,000	7	48.60	137	36x4½	37x5	Gray & Davis	Elec Starter
Peerless, 36	Tour	5,000	6	48.60	137	36x4½	37x5	Gray & Davis	Elec Starter
Peerless, 36	Limousine	6,000	7	48.60	137	36x4½	37x5	Gray & Davis	Elec Starter
Peerless, 36	Land	6,100	7	48.60	137	36x4½	37x5	Gray & Davis	Elec Starter
Peerless, 36	Limousine	6,200	7	48.60	137	36x4½	37x5	Gray & Davis	Elec Starter
Peerless, 37	Tour	6,000	7	60.00	140	38x5½	38x5½	Gray & Davis	Elec Starter
Peerless, 37	Tour	6,000	6	60.00	140	38x5½	38x5½	Gray & Davis	Elec Starter
Peerless, 37	Limousine	7,000	7	60.00	140	38x5½	38x5½	Gray & Davis	Elec Starter
Peerless, 37	Land	7,100	7	60.00	140	38x5½	38x5½	Gray & Davis	Elec Starter
Peerless, 37	Limousine	7,200	7	60.00	140	38x5½	38x5½	Gray & Davis	Elec Starter
Pierce, 38C	Run	4,300	3	38.40	132	36x4½	36x4½	Westinghouse	Air Starter
Pierce, 38C	Tour	4,300	4	38.40	132	36x4½	36x4½	Westinghouse	Air Starter
Pierce, 38C	Tour	4,300	5	38.40	132	36x4½	36x4½	Westinghouse	Air Starter
Pierce, 38C	Broug	5,200	7	38.40	132	36x4½	36x4½	Westinghouse	Air Starter
Pierce, 38C	Land	5,200	7	38.40	132	36x4½	36x4½	Westinghouse	Air Starter
Pierce, 48D	Tour	5,000	7	48.60	134½	37x5	37x5	Adams-Westlake	Acet Starter
Pierce, 48D	Tour	6,100	7	48.60	134½	37x5	37x5	Adams-Westlake	Acet Starter
Pierce, 48D	Limousine	6,100	7	48.60	134½	37x5	37x5	Adams-Westlake	Acet Starter
Pierce, 48B	Run	4,850	3	48.60	142	37x5	37x5	Westinghouse	Air Starter
Pierce, 48B	Tour	4,850	5	48.60	142	37x5	37x5	Westinghouse	Air Starter
Pierce, 48B	Tour	5,000	7	48.60	142	37x5	37x5	Westinghouse	Air Starter
Pierce, 48B	Limousine	6,100	7	48.60	142	37x5	37x5	Westinghouse	Air Starter
Pierce, 48B	Land	6,100	7	48.60	142	37x5	37x5	Westinghouse	Air Starter
Pierce, 66A	Tour	5,850	5	60.00	147½	37x5	38x5½	Westinghouse	Air Starter
Pierce, 66A	Tour	6,000	7	60.00	147½	37x5	38x5½	Westinghouse	Air Starter
Pierce, 66-A	Limousine	7,100	7	60.00	147½	37x5	38x5½	Westinghouse	Air Starter
Pierce, 66A	Land	7,100	7	60.00	147½	37x5	38x5½	Westinghouse	Air Starter
Pope-Hart., 31	Limousine	3,250	5	30.25	118½	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 33	Tour	3,250	5	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart, 33	Tour	3,500	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 33	Phaeton	3,250	5	36.10	124	36x4½	36x4½	Generator	Elec Starter

Non-Poppet-Valve Motors

New Rotating Rod Admits Gases to Cylinder in Latest Speedwell Engine

TO the ranks of the non-poppet valve motors there has come a reinforcement in the new Speedwell rotary-valve motor of Mead design. This joins with the Knight sleeve-valve motor and the single exponent of the two-cycle design, Duryea, in contending the field of the older poppet-valve type. The sleeve-motor and the rotary-valve motor are called non-poppet valve motors because in place of the flat, spring-operated disks by which the ports in the ordinary poppet-valve motor are opened and closed, other means are provided for letting the gases in and out of the cylinder.

CARS WITH NON-POPPET VALVE MOTORS

Stearns	Knight Sleeve-Valve
Columbia	Knight Sleeve-Valve
Stoddard-Dayton	Knight Sleeve-Valve
Atlas	Knight Sleeve-Valve
Edwards	Knight Sleeve-Valve
Speedwell	Mead Rotary-Valve
Duryea	Two-Cycle

CARS WITH DASH GASOLINE TANKS

Hupmobile	Paige, Case
Henderson	Moline, Cartercar

BORE AND STROKE—Continued

Grout, 35	4	4.50x5.50	1.22	to 1
Stoddard-Day, 38	4	4.25x5.13	1.21	to 1
Cunningham, M	4	4.75x5.75	1.21	to 1
Crow-Elkhart, C-5	4	4.13x5.00	1.21	to 1
Studebaker, 35	4	4.13x5.00	1.21	to 1
Perfex	4	3.75x4.50	1.20	to 1
Crow-Elkhart, C-1	4	3.75x4.50	1.20	to 1
Chadwick	6	5.00x6.00	1.20	to 1
Regal, T & N	4	3.75x4.50	1.20	to 1
Schlosser	4	5.00x6.00	1.20	to 1
Pope-Hartford, 31	4	4.32x5.13	1.19	to 1
Flanders, 50	6	4.00x4.75	1.19	to 1
Lozier, 72	6	4.63x5.50	1.19	to 1
Correja, A, B & C	4	4.25x5.00	1.18	to 1
Correja, S & R	6	4.25x5.00	1.18	to 1
McFarlan, M	6	4.25x5.00	1.18	to 1
A. E. C., 6-60	6	4.25x5.00	1.18	to 1
Locomobile, R	6	4.25x5.00	1.18	to 1
Stutz, 6	6	4.25x5.00	1.18	to 1
Republic, D	4	4.25x5.00	1.18	to 1
Republic, E	6	4.25x5.00	1.18	to 1
Kisselkar, 60	6	4.50x5.25	1.17	to 1
Enger	4	4.50x5.25	1.17	to 1
Jackson, Majestic	4	4.50x5.25	1.17	to 1
Case, O	4	4.50x5.25	1.17	to 1
Paterson, 47	4	4.50x5.25	1.17	to 1
Imperial, 34	4	4.50x5.25	1.17	to 1
Cole, 50	4	4.50x5.25	1.17	to 1
Kisselkar, 40	4	4.50x5.25	1.17	to 1
S. G. V. A	4	3.75x4.38	1.17	to 1
Premier, 6-60	6	4.50x5.25	1.17	to 1
Velie, 40	4	4.50x5.25	1.17	to 1
Duquesne, 50	4	4.75x5.50	1.16	to 1
Alco, 11-60	6	4.75x5.50	1.16	to 1
Pope-Hartford, 33	4	4.75x5.50	1.16	to 1
Great Southern, 51	4	5.19x6.00	1.16	to 1
Reeves, Sextoauto	4	4.75x5.50	1.16	to 1
Stutz, 4	4	4.75x5.50	1.16	to 1
Maxwell, 8	4	4.00x4 63	1.16	to 1
Triumph	4	4.75x5.50	1.16	to 1
Zimmerman, Z40	4	4.32x5 00	1.16	to 1
Klinekar, 30	4	4.00x4 63	1.16	to 1
Peerless, 29	4	4.00x4.63	1.16	to 1
Paterson, 43	4	4.13x4.75	1.15	to 1
Cole, 60	6	4.13x4.75	1.15	to 1
Oakland, 42	4	4.13x4.75	1.15	to 1
Oakland, 6-60	6	4.13x4.75	1.15	to 1
Oldsmobile	6	4.13x4.75	1.15	to 1
Cole, 40	4	4.13x4.75	1.15	to 1
Jackson, Olympic	4	4.13x4.75	1.15	to 1
Cartercar, 5	4	4.13x4.75	1.15	to 1
Jackson, Sultanic	6	4.13x4.75	1.15	to 1
Mercer, J & K	4	4.38x5.00	1.14	to 1
Marathon Champion	4	4.50x5.13	1.14	to 1
Dorris, H	4	4.38x5.00	1.14	to 1
Pratt, 30	4	4.00x4.50	1.13	to 1
Spoerer, 40-C	4	4.88x5.50	1.13	to 1
Palmer-Singer, LXIV	6	4.88x5.50	1.13	to 1
Great Southern, 30	4	4.00x4.50	1.13	to 1
Reo	4	4.00x4.50	1.13	to 1
Bergdoll, 30	4	4.00x4.50	1.13	to 1
Columbia, 85	4	4.88x5.50	1.13	to 1
Corbitt, D. E. & F	4	4.00x4.50	1.13	to 1
Richmond, O	4	4.00x4.50	1.13	to 1
Overland, 69	4	4.00x4.50	1.12	to 1
Day Utility, D	4	4.00x4.50	1.12	to 1
Studebaker, 30	4	4.00x4.50	1.12	to 1

Wire Wheels a Feature

Ten American Makers Offer Metal Spokes as Optional or Regular Equipment This Year

ONE of the chief developments of the year is the adoption of wire wheels by ten American makers. The appearance of the wire wheel in America is due to the influence of foreign design and its superiority over the wood wheel that the wire wheel has shown on European roads. Years of actual service and extensive laboratory tests have proven to the satisfaction of makers in England and on the continent that the wire wheel is much superior in the point of strength to the European wood wheels. Probably, however, the advantage in this regard of the wire wheels to American wood wheels is not so great because a much better grade of wood can be obtained in America.

CARS EQUIPPED WITH WIRE WHEELS

Cino, 660	Optional
Edwards, 25	Wire-Demountable
Holly, A	Wire-Demountable
Keeton, 48	Wire-Demountable
Stoddard-Dayton	Optional
Pathfinder	Optional
Stutz	Optional
Henderson	Optional
Arbenz	Optional
Firestone-Col.	Optional

BORE AND STROKE—Continued

Warren, Pilgrim	4	4.25x4.75	1.12 to 1
Auburn, 37L	4	4.25x4.75	1.12 to 1
Imperial, 44	4	4.75x5.25	1.11 to 1
Staver, 45	4	4.50x5.00	1.11 to 1
Michigan, L & O	4	4.06x4.50	1.11 to 1
Midland, T-4	4	4.50x5.00	1.11 to 1
Omaha	4	4.06x4.50	1.11 to 1
Winton	6	4.50x5.00	1.11 to 1
Marmon, 32	4	4.50x5.00	1.11 to 1
Cino, 440	4	4.50x5.00	1.11 to 1
Moon, 48	4	4.50x5.00	1.11 to 1
Mercer, G & H	4	4.50x5.00	1.11 to 1
Carhartt, K	4	4.07x4.50	1.11 to 1
Pacific, Special	4	4.50x5.00	1.11 to 1
Halladay, 40	4	4.50x5.00	1.11 to 1
Westcott, 40	4	4.50x5.00	1.11 to 1
Apperson, 4-45	4	4.50x5.00	1.11 to 1
Moyer, B & E	4	4.50x5.00	1.11 to 1
Crow-Elkhart, C, 7-8-9	4	4.50x5.00	1.11 to 1
Richmond, P	4	4.50x5.00	1.11 to 1
American Tour, 34	4	4.50x5.00	1.11 to 1
Auburn, 40L	4	4.50x5.00	1.11 to 1
Diamond, T, F	4	5.00x5.50	1.10 to 1
Knox, 44	4	5.00x5.50	1.10 to 1
Knox, 66	6	5.00x5.50	1.10 to 1
Franklin, M	6	3.63x4.00	1.10 to 1
Warren, Wolverine	4	4.13x4.50	1.09 to 1
Alco, 7-16	4	3.94x4.25	1.08 to 1
Morse	4	4.63x5.00	1.08 to 1
Krit	4	3.70x4.00	1.08 to 1
Maxwell, 4	4	3.75x4.00	1.07 to 1
Metz	4	3.75x4.00	1.07 to 1
Paige, 25	4	3.75x4.00	1.07 to 1
Ford, T	4	3.75x4.00	1.07 to 1
Pratt, 40	4	4.50x4.75	1.06 to 1
Marathon, Winner	4	4.25x4.50	1.06 to 1
Buick, 40	4	4.25x4.50	1.06 to 1
Regal, H	4	4.25x4.50	1.06 to 1
Grout, 45	4	4.75x5.00	1.05 to 1
Apperson, 4-55	4	4.75x5.00	1.05 to 1
Stoddard-Day, 48	4	4.75x5.00	1.05 to 1
Glide, 45	4	4.75x5.00	1.05 to 1
Great Eagle, B	4	4.75x5.00	1.05 to 1
Selden, 48	4	4.75x5.00	1.05 to 1
Hupmobile, C	4	3.25x3.38	1.04 to 1
Studebaker, 20	4	3.62x3.75	1.04 to 1
Overland, 71	4	4.38x4.50	1.03 to 1
Kisselkar, 50	4	4.88x5.00	1.02 to 1
American Traveler, 54	4	5.38x5.50	1.02 to 1
Franklin, G	4	4.00x4.00	1.00 to 1
Duryea	2	3.75x3.75	1.00 to 1
Franklin, D & H	6	4.00x4.00	1.00 to 1
Kisselkar, 30	4	4.25x4.25	1.00 to 1
Rambler	4	4.50x4.50	1.00 to 1
Buick, 25, 24	4	3.75x3.75	1.00 to 1
Buick, 31, 30	4	4.00x4.00	1.00 to 1
Carroll, 4D	4	5.00x5.00	1.00 to 1
Simplex, 129	4	5.75x5.75	1.00 to 1
Motorette, L, M & R	2	3.75x3.75	1.00 to 1
Locomobile, L	4	4.50x4.50	1.00 to 1
Mason, A. B. C	2	5.00x5.00	1.00 to 1
Cameron	6	3.88x3.75	.98 to 1
Cameron	4	3.88x3.75	.98 to 1
Little Four, A	4	3.50x3.38	.97 to 1
Adams-Farwell, 9	5	5.50x5.00	.91 to 1
Gleason, R	2	4.75x4.00	.84 to 1

BUYERS' GUIDE—$4,000 CLASS—Continued

NAME AND MODEL	BODY	PRICE	SEATS	S. A. E. H. P.	WHEEL BASE	TIRES Front	TIRES Rear	ELECTRIC LIGHT SYSTEM	FEATURES
Pope-Hart., 33	Road	3,250	2	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 33	Limousine	4,300	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 33	Land	4,300	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 33	Berl	4,550	7	36.10	124	36x4½	36x4½	Generator	Elec Starter
Pope-Hart., 29	Tour	4,250	7	46.10	133	37x5	37x5	Generator	Elec Starter
Pope-Hart., 29	Phaeton	4,250	5	46.10	133	37x5	37x5	Generator	Elec Starter
Pope-Hart., 29	Road	4,250	2	46.10	133	37x5	37x5	Generator	Elec Starter
Pope-Hart., 29	Limousine	5,300	7	46.10	133	37x5	37x5	Generator	Elec Starter
Pope-Hart., 29	Land	5,300	7	46.10	133	37x5	37x5	Generator	Elec Starter
Pope-Hart., 29	Berl	5,550	7	46.10	133	37x5	37x5	Generator	Elec Starter
Premier, 6-40	Limousine	4,250	7	38.40	132	36x4½	36x4½	Generator	Air Starter
Premier, 6-40	Coupe	3,750	3	38.40	132	36x4½	36x4½	Generator	Air Starter
Premier, 6-60	Limousine	6,000	7	48.60	137	37x5	37x5	Generator	Air Starter
Premier, 6-60	Limousine	5,500	7	48.60	137	37x5	37x5	Generator	Air Starter
Premier, 6-60	Tour	4,000	7	48.60	137	37x5	37x5	Generator	Air Starter
Premier, 6-60	Tour	4,000	5	48.60	137	37x5	37x5	Generator	Air Starter
Premier, 6-60	Coupe	5,000	3	48.60	137	37x5	37x5	Generator	Air Starter
Premier, 6-60	Road	4,000	2	48.60	137	37x5	37x5	Generator	Air Starter
Reeves, Sexto	Tour	4,500	7	36.10	158	34x4½	34x4½	Esterline	Six Wheels
Republic, E	Tour	3,150	7	43.80	132	36x4½	36x4½	Delco	Elec Starter
Schlosser	Optional			40.00	124	36x4½	36x4½	Battery	
Selden, 48	Limousine	3,750	7	36.10	125	37x4½	37x4½	Gray & Davis	Acet Starter
S. G. V., A	Land	3,500	7	22.50	116	34x4	34x4		
S. G. V., A	Land	3,500	5	22.50	116	34x4	34x4		
S. G. V., A	Limousine	3,500	5	22.50	116	34x4	34x4		
S. G. V., A	Limousine	3,500	7	22.50	116	34x4	34x4		
S. G. V., D	Run	3,000	2	25.60	118	35x4½	35x4½		
S. G. V., D	Tour	3,250	5	25.60	118	35x4½	35x4½		
S. G. V., D	Tour	3,250	4	25.60	118	35x4½	35x4½		
S. G. V., D	Land	4,000	5	25.60	118	35x4½	35x4½		
S. G. V., D	Land	4,000	7	25.60	118	35x4½	35x4½		
S. G. V., D	Limousine	4,000	5	25.60	118	35x4½	35x4½		
S. G. V., D	Limousine	4,000	7	25.60	118	35x4½	35x4½		
Simplex, 127	Tour	5,600	5	38.00	127	35x5	35x5		Acet Starter
Simplex, 127	Tour	5,500	4	38.00	127	35x5	35x5		Acet Starter
Simplex, 137	Tour	5,700	7	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Limousine	6,400	5	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Limousine	6,400	4	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Land	6,400	4	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Land	6,400	5	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Limousine	6,500	7	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Land	6,500	7	38.00	137	35x5	35x5		Acet Starter
Simplex, 137	Broug	6,500	4	38.00	137	35x5	35x5		Acet Starter
Simplex, 129	Tour	6,100	5	53.00	129	36x4	36x5		Acet Starter
Simplex, 129	Tour	6,000	4	53.00	129	36x4	36x5		Acet Starter
Simplex, 139	Tour	6,200	7	53.00	139	36x5	36x5		Acet Starter
Spoerer, 40G	Tour	3,000	5	38.00	120	37x4½	37x4½	Gray & Davis	Elec Starter
Spoerer, 40G	Tour	3,200	7	38.00	120	37x4½	37x4½	Gray & Davis	Elec Starter
Spoerer, 40G	Run	3,000	2	38.00	120	37x4½	37x4½	Gray & Davis	Elec Starter
Stearns, Kn., 4	Road	3,750	3	28.90	116	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Tour	3,750	4	28.90	121	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Tour	3,750	5	28.90	121	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Limousine	5,000	5	28.90	121	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Land	5,100	5	28.90	121	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Tour	3,900	7	28.90	127	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Limousine	5,000	5	28.90	127	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 4	Land	5,100	5	28.90	127	36x4½	36x4½	Generator	Knight Motor
Stearns, Kn., 6	Road	4,850	3	43.80	134	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Tour	4,850	4	43.80	134	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Tour	4,850	5	43.80	134	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Limousine	6,100	5	43.80	134	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Land	6,200	5	43.80	134	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Tour	5,000	7	43.80	140	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Limousine	6,100	5	43.80	140	37x5	37x5	Generator	Knight Motor
Stearns, Kn., 6	Land	6,200	5	43.80	140	37x5	37x5	Generator	Knight Motor
Stevens, Dur., C	Tour	4,500	5	46.10	131	37x4½	37x4½	Adlake	Acet Starter
Stevens-Dur., C	Road	4,500	2	46.10	131	37x4½	37x4½	Adlake	Acet Starter
Stevens, Dur., C	Phaeton	5,000	5	46.10	131	37x4½	37x4½	Adlake	Acet Starter
Stevens-Dur., C	Berl	5,550	5	46.10	131	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Coupe	5,000	2	46.10	131	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Limousine	5,500	7	46.10	131	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Berl	5,700	7	46.10	131	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Tour	4,750	7	46.10	138	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Phaeton	5,250	7	46.10	138	37x4½	37x5	Adlake	Acet Starter
Stevens, Dur., C	Limousine	5,750	7	46.10	138	37x4½	37x5	Adlake	Acet Starter
Stevens-Dur., C	Berl	5,950	7	46.10	138	37x4½	37x5	Adlake	Acet Starter
Stoddard-Day., 48	Limousine	3,900	7	36.10	122½	36x4½	36x4½	Generator	
Stoddard-Day., 13	Tour	5,000	7	48.60	133	36x5	36x5	Generator	Knight Motor
Stoddard-Day., 13	Limousine	6,250	7	48.60	133	36x5	36x5	Generator	Knight Motor
Stoddard-Day., 13	Road	4,900	2	48.60	133	36x5	36x5	Generator	Knight Motor
Winton, 17D	Tour	3,000	5	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Tour	3,000	4	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Tour	3,250	6	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Tour	3,250	7	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Limousine	4,250	7	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Limousine	4,500	7	48.60	130	36x4½	36x4½	Generator	Air Starter
Winton, 17D	Land	4,500	7	48.60	130	36x4½	36x4½	Generator	Air Starter
Velie, 40	Limousine	3,000	5	32.40	118	36x4	36x4	Gray & Davis	Elec Starter
White, GRE	Coupe	3,250	3	22.50	110	34x4	34x4	Own	Elec Starter
White, GEB	Tour	3,300	5	28.90	120	36x4½	36x4½	Own	Elec Starter
White, GEB	Tour	3,500	7	28.90	120	36x4½	36x4½	Own	Elec Starter
White, GEB	Road	3,300	2	28.90	120	36x4½	36x4½	Own	Elec Starter
White, GEB	Coupe	4,100	3	28.90	120	36x4½	36x4½	Own	Elec Starter
White, GEB	Limousine	5,000	7	28.90	120	36x4½	36x4½	Own	Elec Starter
White, GF	Tour	5,000	7	43.80	132	37x5	37x5	Own	Elec Starter
White, GF	Tour	5,000	5	43.80	132	37x5	37x5	Own	Elec Starter
White, GF	Road	4,800	2	43.80	132	37x5	37x5	Own	Elec Starter
White, GF	Limousine	6,300	7	43.80	132	37x5	37x5	Own	Elec Starter

MOTOR AGE
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1913 Giving More for the Money

PRICE of the original car and cost of operation are two factors that interest a majority of the buyers today, and although the purchasing price always has been an important consideration, the cost of operation has not been considered so seriously heretofore as it will during this year, because of the rise in fuel prices as well as the general increase in the cost of living.

THE buyer in scanning the buyers' guide published in this issue, in which every car model for the year is listed, will, on comparison with the prices of 1912, be first impressed with the general increase which varies from $25 to $500 per car, but while at first glance the prices are higher, a search through the equipment of these vehicles invariably proves that the buyer is getting much more for his money than he did a year ago. In other words, the added equipment more than counter-balances the added price. Then, too, there are not a few examples of where more equipment has been added and the prices reduced. Nearly a dozen concerns have done this, which has been made possible by a reduction in the number of models, by increase in the annual production and consequent cost in production, and also by redesigning corresponding motor and gearset parts in different models so they are more readily manufactured and so there is a reduction in the amount of changing factory machines for the manufacture of these parts in the different models. All these combine to give more to the buyer.

BUT the buyer for this year has other advantages over the buyer of last year, namely, in that the equipment is better and more complete, so that when he purchases the machine he is through so far as money expenditure is concerned. The car sold with top, storm curtains, glass front, demountable rims, speedometer, clock, horn, anti-skid attachments, electric lights and engine starter is ready for the roads, and there practically is no necessity for him to have to waste an hour or spend a dollar in adding contraptions to his machine. This is a great gain, chiefly with cars listing from $2,000 up, as previously cars selling below this figure have been quite rationally equipped, often the equipment being the appetizing feature of the sale.

FORGETTING for the moment the dollar-and-cent phase of this question and looking at the car so far as improvement in running is concerned, here, too, improvements are apparent. The bodies are larger—not very much—just a few inches added to the wheelbase to give the necessary foot room which has been lacking. Not a few makers have found it necessary to add an inch or so since their first announcements of 1913 models were made, they having discovered that an added feature here or there has infringed on the space available, and the only solution was to add more space. But when more space has been added only half the tale has been told—there is more. Upholstery has been immeasureably increased, so much so that scarcely anything else of the rear seat can be seen—the seat cushion reaches almost to the floor. The left-seat front passenger has been looked after by the more general use of a divider, or partition, which serves to satisfactorily keep him away from the left arm of the driver. In the coupe and other closed models the left seat often is a few inches farther to the rear, giving both driver and passenger additional room.

IN the last year the readily-adjusted storm curtain has made wide inroads into the top field. These curtains by their design permit of being brought into use in less than a minute should the exigency arise. A valuable feature of them is that in cold weather they permit of easy entrance and exit to the tonneau. Hand in hand with this accessibly-worked-storm-curtain campaign is the more rational attachment of the windshield, which is being brought back nearer to the steering wheel where it affords more adequate protection, with the advantage of a better road vision. Some of the more aggressive makers have improved the windshield action so that in one position it serves to divert the air current towards the floor, assuming the role of a ventilator. The more general use of the cowl dash has assisted in this windshield trend.

TO THE cowl dash must be ascribed another tendency of the season, namely, locating the gasoline tank within the cowl and feeding by gravity, the advantage of this location consisting in the added baggage space available under the front seat. Europe started America thinking on this tank location, and undoubtedly by the beginning of next season there will be as many American concerns locating it here as there are European. There are several concerns carrying the tank in the rear that should give a more accessible filling funnel, which funnel is satisfactory when there is not a baggage trunk carried, but which is not sufficiently accessible with a trunk. Where the tank is located in the dash a side filler should be fitted.

THE advent of electric lighting has brought with it the necessity of an accessible switchboard with press buttons or other means for bringing on the lights. The heavily cowled dash makes it nearly impossible to mount these buttons on the vertical part and yet have them accessible enough for ready operation. One company has built a support on the steering column for them, others are mounting them on the forward face of the front seat and a few are bringing them out onto the face of the cowl.

FOR those who prefer left-hand location of the steering wheel there is the assurance that 25 per cent of the listed models are so fitted, a remarkable showing in this field. In addition to this are others who give an option on the location. The left position of the wheel takes with it either right-hand or left-hand operation of the levers for speed-changing and brake operation. Those placing these levers in the center are showing wise discretion in moving them back into the space between the seats where they do not interfere in the slightest with entrance to the car, and in which position the one-piece robe can be used.

THE owner-driver will have many more improvements on the obtaining of which he can congratulate himself. Carbureters are generally near to the heart of the driver, and for this year they show general improvement. Not a few concerns have brought out multi-jet types to give a more general performance for low, intermediate and high speeds. Easy-starting devices have been installed; there are fewer adjustments; in a word, everything is aimed to give more miles per gallon and less trouble.

Some Possibilities of the Future

The Motorist's Dream

Two Bid for United Motors Properties

NEW YORK, Jan. 8—Special telegram.—Two bids, one for about $7,000,000 and the other to pay a percentage of the indebtedness of the United States Motor Co. and its subsidiaries, were made in the United States district court today.

Judge Charles M. Hough received the bids and announced that he would rule which, if either of them, would be accepted by Friday. The bidders were Henry C. Holt and William McAlister, acting for the reorganization committee. If one of the bids is accepted the property will be transferred to the Standard Motor Co., a Delaware corporation, of which Walter E. Flanders will be president and W. F. McGuire vice-president.

The receivers reported that the losses incurred in manufacturing since they took hold were $308,000 and that all the factories are closed as far as New York is concerned except the Briscoe Mfg. Co.

The Standard Motor Co. has taken out a charter in Delaware with a capitalization of $31,000,000. Eleven million dollars of the new company's capitalization is 7 per cent cumulative first preferred, $8,000,000 is 6 per cent non-cumulative second preferred and $11,000,000 is common stock.

It is planned that three voting trustees shall have control of the new stock for the next 5 years—Charles H. Sabin, Harry Bronner and James C. Brady. Hall Garten & Co. head a syndicate which has agreed to purchase for $5,720,996 the voting trust certificates representing the stock allotted to shareholders who have assented to the reorganization plan of last October.

The new officers of the company will be Walter E. Flanders, president and general manager; W. F. McGuire, vice-president; Carl Tucker, treasurer, and M. L. Anthony, comptroller. The board will be made up chiefly of members of the reorganization committee.

MAXWELL IN INDIANA COURTS

Indianapolis, Ind., Jan. 6—There was a new turn in the affairs of the Maxwell-Briscoe Motor Co. and the United States Motor Co. last Friday, when the Indiana creditors of the Maxwell company asked that that concern be adjudged bankrupt, the petition being filed in the federal court in this city. These same creditors filed a petition in the superior court here recently asking that the Newcastle plant be sold separately from the other Maxwell plants, which petition was later filed in the New York courts.

Among the charges in the involuntary bankruptcy petition are that the Maxwell company indorsed notes for the United States Motor Co. to the extent of $500,000 when the latter was indebted to it; turned over $5,000 to the United States Motor Co., and assigned $10,000 to certain creditors, in preference to others, in September. It is also charged that the Maxwell company made no contest against having a receiver appointed for it in New York. It is charged that the Maxwell company assumed debts of the United States Motor Co. for the purpose of defrauding creditors.

New York Court will Make Decision in Matter on Friday

The Indiana creditors filing the petition and their claims are: The Kahler Co., New Albany, $15,951.14; the Newcastle Lumber Co., Newcastle, $3,745.46; the Newcastle Foundry Co., Newcastle, $2,647.75; the National Spring Co., Newcastle, $23,502; the Whiteley Malleable Castings Co., Muncie, $7,947.54; the Muncie Foundry and Machine Co., Muncie, $13,864.84, and the Muncie Wheel Co., Muncie, $2,643.

FORD DENIES PLANT SALE

Detroit, Mich., Jan. 6—The following statement was made by the Ford Motor Co. today: "Rumors to the effect that the Ford Motor Co. has been sold to the Standard Oil Co. are absolutely without foundation. There have been no negotiations of this character, and, in fact, no negotiations with anyone for the sale of the company as a whole or any part of its stock."

LION MOTOR CAR CO. PLANT SOLD

Detroit, Mich., Jan. 6—Referee in Bankruptcy Joslyn has effected the sale of the factory equipment of the Lion Motor Car Co., of Adrian, after the sale had been postponed twice on account of low bids. The property goes to Samuel Winternitz & Co., of Chicago, for $13,000. At the first sale the highest bid was $7,000, and the second time it was offered Winternitz & Co. bid $12,500, raising their own bid the last time the property was offered. Attorney Charles L. Robertson was named as trustee in the proceedings.

The tangible property was appraised at $33,401.73. The various claims presented against the company when business was suspended amounted to $108,000. The actual amount of liabilities outstanding are estimated by Attorney Robertson at about $75,000.

TIMKEN TAKES UP BROWN GEAR

Detroit, Mich., Jan. 4—Announcement has just been made by the Timken-Detroit Axle Co. of an alliance which has been made between the Timken company and David Brown & Sons, of Huddersfield, England, for the purpose of supplying the American market with the David Brown type of worms. A new corporation to be known as the Timken-David Brown Co. will make and sell worms and worm gears for pleasure and commercial cars. The plant of the Timken-David Brown Co. will adjoin that of the axle company, Clark avenue near Fort street, Detroit. A building now is in course of construction. Pending completion of the plant and the manufacture of special machinery in England the worms will be imported.

DES MOINES EXTENDS SHOW TIME

Des Moines, Ia., Jan. 6—Owing to the unusual interest forecasted for the commercial car department of the Des Moines show it has been decided to give an entire week instead of 3 days to this feature of the show. The pleasure car show will start on March 3 and the commercial car show on the following Monday.

HUB FACES 25-CENT GASOLINE

Boston, Mass., Jan. 4—Boston motorists are now facing 25 cents a gallon gasoline and a howl is going up that may cause some trouble before it ends, due to the fact that it is reported that a number of men who have garages have held a meeting and are trying to form an agreement that a standard price of 25 cents shall be charged. Some of the motorists who belong to organizations and are attorneys have called the matter to the attention of the counsel for the associations, with the result that there is now talk of prosecutions under the state law passed last year that prohibits any such combinations.

A few motorists have said that if they can get evidence that any garages are combining on the price they will present a bill to the legislature calling for a license for every dealer in the product and for state supervision of sales so there can be no such combinations. On the other hand, some of the garages are taking just the opposite step. They have announced to their patrons that they will supply them with gasoline at either the wholesale or close to that rate as long as they remain patrons, while on the other hand the transient motorist will have to pay the higher rate of 25 cents a gallon.

HALLADAY ASSETS FOR SALE

Streator, Ill., Jan. 6—Creditors of the Streator Motor Car Co. have been advised that the real estate and tangible personal property will be offered for sale at public auction on January 14. This includes the manufacturing plant located 1 mile southeast of Streator and all cars, finished and unfinished, together with all stock and material.

BALTIMORE ON SHOW CALENDAR

Baltimore, Md., Jan. 6—Formal announcement is made that the Fifth Regiment armory again has been secured for the holding of this year's show, the dates of which will be February 18 to February 22, inclusive.

Court Decides Against Prest-O-Lite

CHICAGO, Jan. 8—Decision was rendered yesterday in the United States circuit court of appeals, seventh circuit, against the Prest-O-Lite Co., of Indianapolis, and in favor of the Searchlight, in the appeal of the patent infringement suit filed by it last spring in the circuit court, in which it was defeated last June. The original suit was denied in the United States circuit court by Judge Kohlsaat, and the present suit is an appeal to the circuit court of appeals by the Indianapolis interests. The case was heard by Judges Baker, Seaman and Humphrey, and the former decision was affirmed in the decree handed down yesterday by Judge Humphrey. Winter, Bartlett & Hamill represented the Prest-O-Lite Co., and Parsons & Lane defended the Searchlight interests.

The suit was brought by the Commercial Acetylene Co., holder of the Claude & Hess letters patent No. 664,383, and the Prest-O-Lite Co., sole holder of license from the Commercial Acetylene Co., to manufacture under the Claude & Hess patents. These patents refer to a closed vessel containing a supersaturated solution of acetylene gas, supplied with a reducing valve for the release of the gas at substantially uniform pressure. The patents expire on their face—December 25, 1917.

After considerable favorable litigation, starting February, 1909, in which the Avery Portable Lighting Co., of Milwaukee, was restrained from further manufacture and sale of its product, followed by similar action against the Auto Lux Mfg. Co., the Acme Acetylene Appliance Co., and the Des Moines Auto Gas Co., Judge Kohlsaat rendered the first decision against the Prest-O-Lite interests in refusing to grant a motion for a preliminary injunction against the Searchlight Gas Co., on April 26, 1912. He ruled that the American patents have expired by reason of the expiration of the British patents, held identical with the Claude & Hess patents.

Chicago Judges Refuse Appeal in Case Against Searchlight

The prosecution then brought suit in the circuit court charging infringement, and again was defeated. In the appeal just decided, the defendant claims non-infringement on the grounds of the expiration of the British patent.

In the affirmation of the decision in the lower courts, Judge Humphrey ruled that the needle-valve used in the Searchlight appliance did not infringe on the Prest-O-Lite reduction valve, that as this is the material element of the combination, the Searchlight tank is not an infringement on the older device. The decree of the lower court is that the treaty of 1902 and the act of congress of 1903 does not apply to this case. It is thought that the decision just rendered will be final.

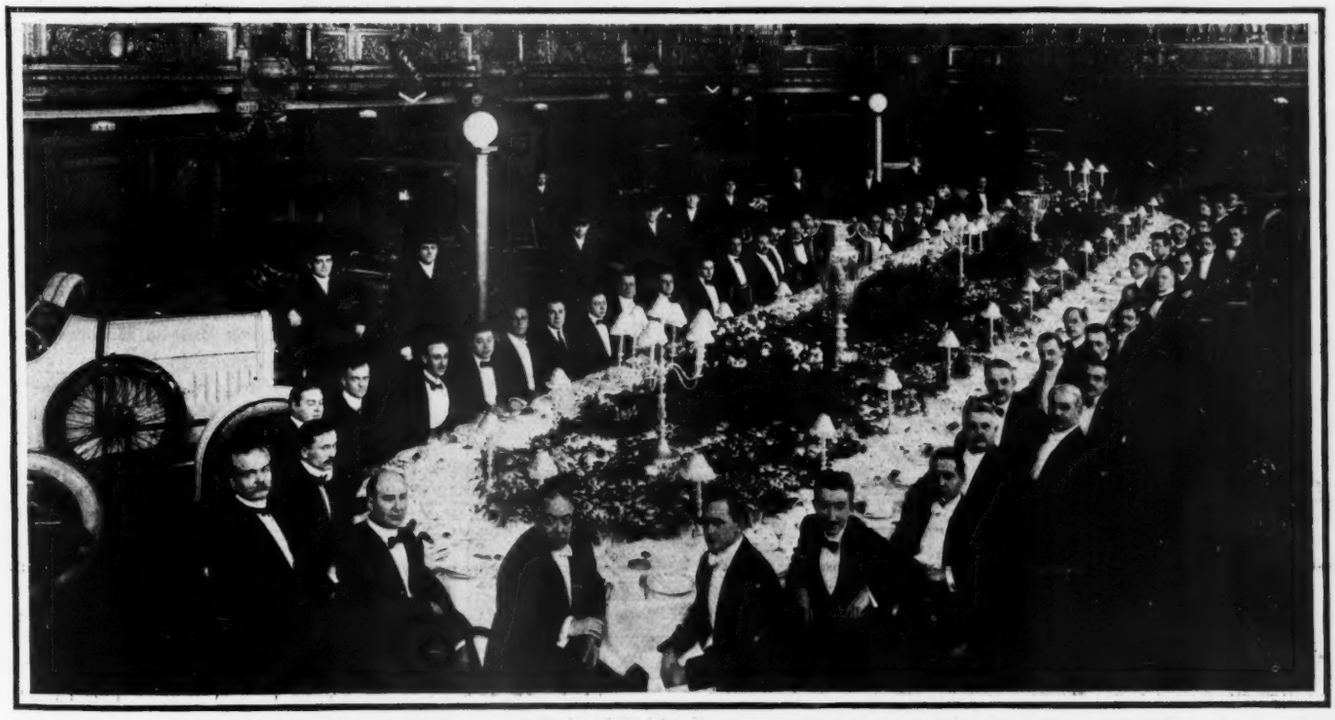
RAMBLER CHANGES AND PROMOTIONS

Kenosha, Wis., Jan. 6—With the coming of the new year the Thomas B. Jeffery Co., maker of the Rambler, has made several changes in its executive staff, which include a number of promotions, the make-up of the board now being: President, Charles T. Jeffery, who also is general manager; vice-president, Harold W. Jeffery; second vice-president and treasurer, George M. Berry, who has been general sales manager; secretary, Edward S. Jordan, who will continue in charge of advertising and publicity; assistant secretary, Edward F. Maddock, who has been in charge of the credit and accounting department.

Louis H. Bill, who has been in charge of the Pacific coast Rambler business for a long time, is appointed assistant general manager. Harry E. Field, from the Rambler New York territory, has been made general sales manager, while George H. Cox retains his position as assistant sales manager. J. W. DeCou is named for factory manager, with John Bjorn assistant factory manager and general superintendent. Two assistant superintendents are George M. Bliss and M. Mattson. Three general foremen just appointed include William Martinson, C. P. Heide and H. M. Luthi.

RICKER RESIGNS HENDERSON JOB

Indianapolis, Ind., Jan. 6—Chester S. Ricker, chief engineer and designer of the Henderson, having completed the design of an electric starter, has resigned in order to enter the broader field of consulting engineering. He will be retained in an advisory capacity by the Henderson company to design its six-cylinder car which is being brought out.



BANQUET HELD BY NEW YORK IMPORTERS BEFORE OPENING OF SALON

Ten Foreign Makes in New York Salon

Fifty-Six European Cars in Show Held in the Hotel Astor

NEW YORK, Jan. 2—The Importers' Salon opened here today with an exhibit of ten makes of cars, shown in various body types and aggregating a total of fifty-six displays as follows: Limousines, 24; touring cars, 14; landaulets, 7; chassis, 4; runabouts, 2; coupes, 2. This list includes the special Kellner body of the Panhard & Levassor Co. which combines the possibilities of touring and landaulet cars.

Cars Make Fine Showing

A fairly international assembly of cars, as this exhibition might be called, the Importers' Salon contains products of all European car-producing countries except Great Britain. Four French makes, two Italian and Belgian, and one each of Austrian, Canadian and German origin are being shown. Besides a number of imported bodies fitted to the cars, there also are American creations to be seen which were produced in the respective shops of Healy & Co., the Holbrook Co., Locke & Co., and Quinby & Co.

These displays, arranged in the ball room of the Hotel Astor, make a fine exhibition. Unfortunately, a number of cars which were shown at the salon during January, 1912, were not represented at this exposition. These absentees included several leading English makes and also a few French.

Shown for the first time in New York, the Austro-Daimler display is interesting. The four motors made by the Austrian company are shown in the several leaders of its line, these being the Prince Henry, Alpine 1911 and Alpine 1912 touring body, mounted on 27, 32 and 80-horsepower chassis, respectively. Another car on a 60-horsepower chassis completes the line. The Prince Henry type undoubtedly is the most striking representative of Austro-Daimler practice, being fashioned as a stream-line body and with a Metallurgique type of radiator. The other types of body are equipped with straight radiators. All of them are equipped with Bosch two-point ignition, force-feed lubrication, and double-bevel shaft drive to the live rear axles. Two sets of brakes are used, the service brakes acting on the transmission shaft and the emergency brakes on the wheel drums. Four-speed selective transmissions are used throughout the line of Austro-Daimler cars, and wooden or wire wheels are furnished at the option of the purchaser.

Few Changes in Merecedes

The Mercedes people have made few changes for the 1913 products. The old chassis are being continued, with such minor improvements as a double cone-clutch, a ring-sleeve air valve for varying the air admitted to the carbureter for a given throttle opening, and a closer arrangement of the double sets of spark plugs in their cylinders than has been used heretofore. Furthermore, an air pressure regulating valve which formerly was carried on the front of the dashboard now is in place between the latter and the radiator, being thereby made more accessible than before.

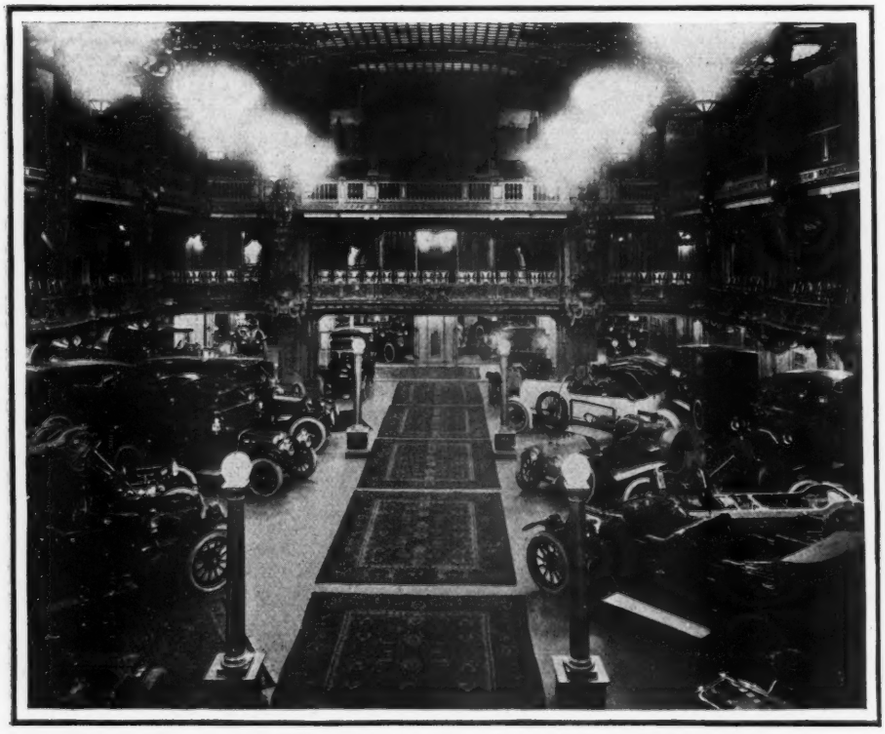
Panhard & Levassor exhibit 20 and 30-horsepower cars of the Knight type, although they also are ready to supply poppet-valve motors. In all other respects valveless and poppet chassis are alike for both sizes of chassis. The Knight lubrication system has been improved upon by the use of an automatic circulating, non-mechanical oiler working as follows: The oiler consists of a reservoir the outlet of which is governed by a needle valve regulating the passage to the highest crank-chamber trough, from which the overflow passes into the next trough, and so forth. The oil splashed up by the scoops of the connecting rod ends in the fourth trough returns to the reservoir by its momentum and after being strained is recirculated. Otherwise the power plant is the same as before, with the Panhard-Krebs carbureter used. The fuel is fed by the pressure of an air pump. The unit scheme of motor and gearbox, as well as three-point suspension, are this year's foremost features. Instead of the multiple-disk clutch, a single-disk design is used in the 1913 product. One of the principal innovations is the use of a seven-eighths elliptical spring.

Four de Dion chassis, the 10-16, 30, 50 and 100, are shown at the Astor. The de Dion-Bouton product having been described in a previous issue of Motor Age, only the chief new features are mentioned here. These are the use of a worm drive between shaft and differential, the standard wire-wheel equipment, Vesta lighting dynamo, set-spark ignition and the carrying under the dash cowl of the gas tank on the 10-16 model. The clean dashboard is a special feature this year, there being only one or two instruments on any of the models.

The Metallurgique's only mechanical change is the substitution of air pressure in the fuel-feeding system for exhaust pressure. Wire wheels are standard equipment for this year. All the other developments are in the body line and will be mentioned specifically below.

Minerva Continues Knight Motor

Minerva cars, made in Belgium like the foregoing product, are in four chassis sizes, namely, 14, 18, 26 and 38 horsepower. The Knight motor has been continued in these cars without change, and the use of a large bevel gear in driving the differential is the principal mechanical feature. Only the small model uses the worm drive. Dunlop wire wheels are standard equipment, but wooden wheels are furnished upon request of the purchaser. A set-spark ignition system is used on all cars this year, and illumination is by means of the Bleriot electric generator system.



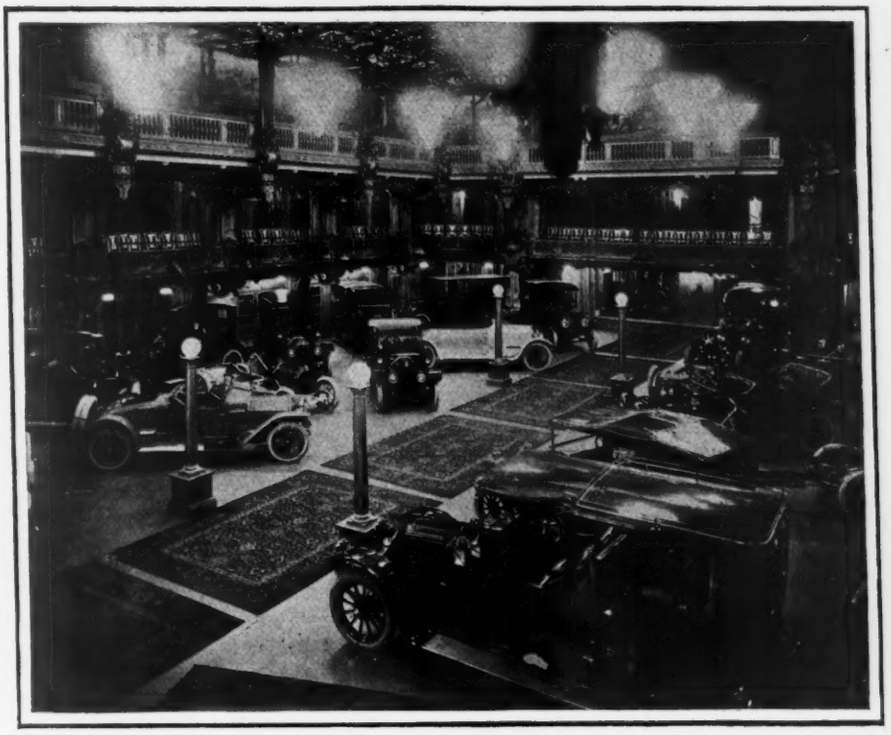
LOOKING DOWN MAIN AISLE OF IMPORTERS' SALON IN NEW YORK

The Isotta-Franschini company is represented by two chassis and several complete cars, every type made by the company being shown. There are six types altogether: the 14-18, 18-25, 25-35, 70-80, 35-45 and 12-horsepower motor chassis, the last two having the cylinders cast in pairs, while the others are block castings. The mechanical features of 1912 have been retained for this year, including the water-cooled brakes on the jackshafts where chain drive is used, and the leather-steel universal joint. Besides the option of wooden or wire wheels, the buyers of Isotta cars may obtain Sankey pressed steel wheels, of English manufacture.

Two Lancia Models Shown

Two Lancia models, the 20 and 30-horsepower cars, are shown at the salon. The motors are 3.14 by 5.11 inches and 3.93 by 5.11 inches, respectively. These motors are operated at higher speeds than former models and are cooled by larger radiators. The motor compartment is closed up against the dashboard by an aluminum face plate, which keeps the heat from the wooden board. A dry-disk clutch is used this year instead of the type running in oil formerly applied. Wooden wheels and Gray & Davis lighting dynamo are standard equipment.

Renaults for 1913 are built on nine chassis, ranging from 9 to 60-horsepower and equipped with a variety of body styles, including touring cars, limousine and landaulets. Two chassis also are shown. The mechanical developments incorporated in the Renault cars are as follows: The cylinders are offset and the valves are mounted at an angle to the cylinder axes. A Bosch automatically-timed magneto is used. The suspension has been developed to an underslung semi-elliptic system in the rear, instead of the former three-quarter elliptic springs. Renault detachable wooden wheels are used as standard equipment. An interesting feature is the equipment with Ward-Leonard starting-and-lighting, which is used on all Renault cars sold in America, this being the first case in which a series of imported European cars is equipped with American starting outfits.



GENERAL VIEW OF IMPORTERS' SALON IN HOTEL ASTOR

The Canadian Keeton

The Canadian Keeton car is practically identical with the product built in the United States under the same name. A six-cylinder motor rated at 48 horsepower, but delivering 61 in the dynamometer test, and well nigh 70 at the brake, is used in both the seven-passenger touring and the roadster model. The wheelbase is 136 inches with 37-inch wheels in the rear and 36-inch wheels in front. A Renault type of hood is used and no starting crank is attached to the front of the car, due to the use of a Jesco electric starter.

The body design and equipment displayed at the salon this year is most interesting in many respects. The most novel feature perhaps is the Kellner convertible landaulet of the Panhard-Levassor company, which may both be used as a landaulet or as a five-passenger touring car. The rear portion of the upper body half is of leather, while the front is composed of a glass pane sliding between two pillars, which may be folded over it toward the center line of the car, when the pane is in its lowest position.

Metallurgique Bodies

The Metallurgique also is distinguished by its efforts in the line of body development. The star in this respect is the seven-passenger touring car in which there is no partition between the driver's compartment and the passengers' tonneau. On this car the bonnet is shaped with a noticeable convergent flare toward the front, ending into the V-shaped radiator, which gives the car a splendid and streamline-like appearance. Wide mudguards, shaped as the upper half of a flat oblong and aprons bent at right angles, are used. In the new limousine the window curtains are hidden in the woodwork in which the interior of the car is finished. A lazy-tong window lift is used, which permits of holding the window at any height without fastening it and which permits of operating it without the use of straps by a small handle on the glass pane.

The Isotta also has an original body feature, consisting in the use of very narrow mudguards, those on the front wheels being used as carriers for the side lamps, which are fed from a dynamo generator.

Europe Offers $100,000 for Gasoline Substitute

PARIS, Dec. 24.—Seriously alarmed at the increasing cost of gasoline, the International Association of Recognized Automobile Clubs, at its meeting in Paris, decided on the proposal of Rene de Knyff, to offer a prize of $100,000 *for the best alternative fuel for use in existing internal combustion motors. The regulations of the competition have yet to be drawn up, and will not be made public until a promise has been obtained from the governments of the interested countries that the new fuel will be either free from taxation or admitted at a very low fixed tax. The fuel must be available in big quantities, and must be of such a nature that it cannot be monopolized by trusts.*

The countries represented at the conference were France, Great Britain, Germany, Austria, Belgium, Denmark, Holland, Hungary, Italy, Russia, Switzerland, Sweden, Egypt, Roumania and America. The American delegates were George Heath and William S. Hogan. The national clubs of these nations have agreed to raise the sum of $100,000 *for the fuel prize.*

New York Preparing for Its Big Show

Workmen Start Decorating Madison Square Garden and Grand Central Palace

NEW YORK, Jan. 6—America now is to have its show season. England's Olympia and the Paris salon each has had its inning and furnished Europe with a line on foreign motor tendencies. Now this country is awaiting the raising of the curtain, which takes place next Saturday, when the Automobile Board of Trade inaugurates the annual New York show in Madison Square garden and Grand Central palace.

The New York show is divided into two parts, the first week—January 11-18—being devoted to pleasure cars and the second week—January 20-28—being given over to the commercials. All told, there will be 702 exhibitors in the two buildings for the 2 weeks. Part I, during which pleasure cars, accessories and motor cycles are to be shown will have 467 exhibits. Part II, which is to house commercial vehicles and accessories will have over 250 exhibitors. In the garden forty-two makers will display pleasure vehicles the first week, while the palace has a greater number—forty-six all told.

The work of preparing the buildings for the show started today when 760 men began rebuilding the interior of Madison Square garden. These 760 workman included steel construction workers, decorators, carpenters, electricians, sheet metal men, carpet layers, sign painters, elevator builders, sculptors, telephone linemen, painters, and men of numerous other trades. In all, there will be 1,200 people employed by the show management in the garden during the show period.

A little farther up the line, a few hundred men are busy getting the Grand Central palace into shape for its half of the show, but inasmuch as this building will not have to have its interior entirely rebuilt, such a large army of workmen is not necessary. In the garden, the heaviest feature of the work of rebuilding is the erection of the steel pillars and suspending the steel girders which support the elevated platform and extra, wide balconies. Four gangs of men, twenty-five in each gang, have their work cut out for them. Two steam hoisting engines and two electric hoisting engines are required for their operations.

The most remarkable thing about their work is that within 3 days they erect a larger skeleton of steel which supports greater weight than the steel frames of the average office building. When one stops to consider this huge network of steel measures more than one-sixth of a mile around and that more than 200 tons of metal and more than a million feet of lumber enter into its make-up and furthermore that this great inner ribbing of the garden can be dismantled again within a few days after the show is over without injuring the building itself—one can regard the work as a truly remarkable piece of constructive engineering.

This has been the transformation process at each of the last two motor shows in the garden. It is done in order to increase the floor space in the building and the galleries extend out into the amphitheater towards its center anywhere from 20 to 50 feet. Five thousand square feet of mirrors in the wall panelling will convert the building into a veritable crystal palace, these mirrors producing an optical illusion which will make the garden appear much larger than it really is.

White and gold are to be the dominant colors, although green and crimson will be strongly in evidence. The girders of the big dome will be screened by a canopy of 5,400 yards of fire-proofed cloth of fluffy azure blue, amid which 7,700 tungsten incandescent lamps will twinkle. Twenty huge arc lamps with crystal skirts or shades will be pendent from the roof. Fifty thousand feet of wire will be necessary to wire the building.

Workman will be required to work night and day to complete the gigantic task. Not only is there much rough construction, but several tons of fireproofed lattice work to cover all this will be required. There will be an abundance of foliage strung. More than 12,000 yards of carpeting will be used in the garden.

A late announcement is to the effect that the Krit will spring its new six at the show which has a 3¼ by 5-inch motor, 120-inch wheelbase and which comes completely equipped.

MORE ROOM FOR CHICAGO SHOW

Chicago, Jan. 6—Many belated applicants for space at the Chicago show, who have been greatly disappointed by the fact that no more exhibition space was to be had in the Coliseum, annex, or First Regiment armory during either the first or second week of the show, will, after all, be given an unexpected opportunity to make displays at the show.

Manager S. A. Miles has secured the use of the Wilson building, adjoining the Coliseum annex on the south, for the show period. This building is practically the same size as the annex and the floors are free from obstructions of any sort. This will enable the largest passenger cars and motor trucks to be shown to advantage without any interference by posts or low ceilings. The building has a main entrance on Wabash avenue, but by opening passage ways through the south wall of the annex, it can be made to all intents one building with the Coliseum, so that space in it will be even more desirable than in the annex.

By this solution of the problem of providing more space to accommodate those who desire it, the management is enabled to take care of five additional passenger car exhibits, about eight more commercial vehicle displays and about thirty more accessories exhibits. The passenger car space already has been taken by applicants, the commercial vehicle allotments will be completed this week, and the accessory spaces have just been offered to the first thirty applicants on the waiting list in the order in which their applications were received. With these additions the count of exhibitors in the show will be as follows: Passenger car manufacturers, 102; commercial vehicle builders, 77; accessories manufacturers, 244. Most of the accessory exhibits will remain in place throughout both weeks.

Spaces in the Wilson building have been taken by the Mercer Automobile Co., and Midland Motor Car Co., previously allotted annex basement spaces; Paige-Detroit Motor Car Co., allotted space in the armory; and the W. H. McIntyre Co., the Republic Motor Car Co., of Hamilton, O., and Century Electric Car Co., have accepted the basement spaces thus made vacant.

The new motor truck exhibitors which have accepted offers of space are the Grand Rapids Motor Truck Co., Grand Rapids, Mich.; Driggs-Seabury Ordnance Corporation, Sharon, Pa.; Randolph Motor Car Co., Chicago; Edwards Motor Car Co., New York, and the O. Armleder Co., Cincinnati.

This late acquisition of the Wilson building for show purposes throws a big extra task upon the decorators to get material ready and installed to dress the walls in harmony with the general decorative scheme of the Coliseum and annex, but the resources are equal to the occasion.

FIRST SHOW OF THE YEAR

Cleveland, O., Jan. 4—The first show of 1913 was formally opened tonight in the new Wigmore garage, promoted by the Cleveland Automobile Show Co. The mayor officiated in the ceremonies and a crowd of 7,000 turned out. This is the eleventh annual show for Cleveland and the indications are that it will be even more successful than its predecessors. Forty-four dealers and makers are represented among those displaying cars, which number includes trucks as well as passenger vehicles. While the attendance tonight was made up mostly of city folk, it is thought that before the end of the show many dealers from outlying territory will be attracted, while many sales ought to be made among the farmers in this section of the state.

Fortune Spent Promoting Paris Salon

PARIS, Dec. 28—In an interview with Motor Age representative, Henri Cezanne, general secretary of the Paris show committee, stated that the organization of the recent salon had cost from $250,000 to $300,000, this being the largest amount ever spent on any motor car show. The electric light bill worked out at the rate of $500 an hour, the total amount spent on lighting being 20 per cent higher than on any previous occasion. The increased cost was due to the fact that this year the entire decoration was in the hands of the organizing committee, which furnished completely equipped stands to the individual exhibitors.

Although the total cost had been higher, the increase in the gate money and the larger amount received for the rental of stands left a substantial profit in hand. M. Cezanne estimated that the sum of $100,000 would remain to be shared out among the individual exhibitors and the trade association responsible for the show.

October Show in 1913

"It has been decided," declared M. Cezanne, "to hold a show in Paris next year, most probably during the month of October instead of the month of November. This change of date will be adopted in order to diminish as far as possible the present annual slack season. It is found that there is a falling off in the amount of business done from the month of July, and the increase in business is not felt until after the show. If the show is not held until the month of December, the slack season is felt more or less for 4 months. If the show is held in October this period of slackness will only last for 2 months."

Up to the present the London show has opened the European series, and the British trade always has laid emphasis on the fact that London was the center of the European motor trade. The unprecedented success of this year's Paris show has begun to shake the Englishman's belief in the impregnability of Olympia, and with such natural facilities as the French enjoy in the Grand Palais and the determined effort they are now making to retrieve their former mistakes, it hardly seems possible that London can remain more important than Paris as a trading center. The fact cannot be denied that thousands of dealers and private purchasers on various parts of the continent of Europe find it more convenient to come to Paris by rail than to make a railroad and steamship journey to England.

Question Value of Show

"Personally I do not consider that an annual show is worth while," explained M. Cezanne, "and there are plenty of manufacturers who are of my opinion.

Facts and Figures About Cost of Running Recent French Show

Experience has shown us that the annual show does not increase the volume of business. It undoubtedly helps the small firms to come to the front, and it enables foreigners to get on our market. It really is more advantageous for us to take part in shows in foreign countries than to exhibit at home.

"The settled condition of motor car design is another reason why shows should not be held every year. Although 2 years have elapsed since a show was held in Paris, the mechanical changes are not of sufficient importance to necessitate such a costly demonstration as the Paris salon.

"Until we can come to an agreement with the English manufacturers, by which the two shows will be held every 2 years—not alternately—we shall be obliged to hold a show in Paris every year. A show in Paris one year and in London on the following year is not desirable, for practically the same preparations have to be made by our manufacturers to exhibit in London as to participate in the Paris show. This arrangement therefore amounts amounts, practically, to an annual show. As soon as the English declare that they are ready to work with us in the organization of shows every 2 years we shall abandon the annual exhibition.

"Business has been excellent," declared M. Cezanne. "It is obviously impossible to state what amount of business has been transacted within the Grand Palais, but in every section of the show—car manufacturers, body makers, tire makers and dealers, accessory dealers—the statement is made that business has been decidedly brisk."

Cost of Exhibiting

The Paris salon has now ranked for several years as the most important trade exhibition in France. Five trade associations appoint delegates to a joint committee responsible for the organization. A uniform system of decoration is adopted and rental rates are made sufficiently high to assure the payment of expenses. The biggest stands in the show, having an area of 80 square meters, cost $4,000, $3,200 and $2,400, according to whether they are in the first, second or third zone. Stands having an area of 60 meters cost $2,700, $1,800 and $1,200, according to position. The third series of stands, measuring 40 meters, cost $1,600, $800 and $480. There are other stands not on the main floor having prices as low as $6 per square meter. These prices include complete fittings and electric light.

Out of the profits of the show 40 per cent is returned to the exhibitors in proportion to the amount paid by them for the rental of stands; 40 per cent is returned to the exhibitors who for 6 months have been members of one of the organizing trade associations, and 20 per cent is paid over to the five organizing associations in proportion to the amount paid by their members for stand rental.

The Paris salon is admittedly the most important social function of its kind. The decorations and illuminations are designed to attract the attention of the wealthy classes, yet the price of admission is kept sufficiently low to suit practically everybody, being only 20 cents on all days but Fridays and the opening day, when it is increased to 60 cents and $1 respectively. The Republican Guards' military band is secured for the opening day, this band being recognized as the finest of its kind in Europe. On all other days a very high class orchestra is secured.

Not Open in Evening

The show always has closed its doors at 6 o'clock. This year, by special request, they were kept open until 6:30 o'clock, but on a careful count being taken it was found that the number of people entering during this last ½ hour was only thirty-one. As the additional ½ hour entailed an additional expenditure of $300 for light and attendance, the experiment naturally was looked upon as a failure.

TWO SHOWS FOR PROVIDENCE

Providence, R. I., Jan. 4—Providence is to have two motor car shows during the week of January 25 to February 1 inclusive, according to plans that have been worked out now. The one to be held by the Rhode Island Automobile Dealers' Association is to take place in the state armory and it will occupy 38,547 square feet of space. Apparently it was not possible for all those who wanted to exhibit to get space and so the rival show is to take place at the Hotel Narragansett at the same time. This is to be held by J. P. McDonald, manager of the hotel.

LOUISVILLE PICKS DATES

Louisville, Ky., Jan. 6—At a recent meeting of the Louisville Automobile Dealers' Association it was decided to hold the sixth annual exhibition of the organization March 12-15. The show, as usual, will be staged in the First Regiment armory, which covers more floor space than any other building in the south.

TWO SHOWS IN PHILADELPHIA

Philadelphia, Pa., Jan. 6—The opposition show to be conducted by the Philadelphia Automobile Board of Trade, Ltd., at the First Regiment armory, Broad and Callowhill streets, during the week of January 18-25, will make a feature of foreign-built cars in addition to representative American cars.

Hill in Fiat Wins San Diego Road Race

SAN DIEGO, Cal., Jan. 1—The first San Diego road race, two laps around a course extending through the hills and along the coast for a distance of 190 miles, was won today by Walter Hill in a 120-horsepower Fiat, at an average of 57.1 miles per hour.

The finish was at Pacific beach and Hill finished 10 minutes ahead of Smith in a Mercer. Considering the mountain grades and the winding road, Hill's time of 3 hours 59 minutes 36 seconds was very fast. The course, while over miles of good highway, also embraced two mountain grades and a number of stretches of rolling, winding road, on which the daring drivers courted danger at every turn.

Hardly less remarkable was the showing of W. H. Smith and his little Mercer. W. H. Carlson, Jr., driving the Stutz No. 20, after he had been given up as out of the money, came to the front and won third place.

Smith's time was 4 hours 12 minutes 12 seconds; Carlson's time was 4 hours 16 minutes 15 seconds, and Louis Nikrent, Buick, who came in fourth, made it in 4:48:09.

Broken springs and radius rods were mainly responsible for Bob Burman's failure to place. Spider Campbell had engine troubles and quit at the finish of the first lap. C. A. Conant's National went into the ditch at Encinitas on the first lap and broke a wheel. Al Lambis, in a Columbia, was thrown out of the running after finishing the first lap. The steering gear gave out on Torrey Pines grade.

More than 100,000 people lined the sides of the road on which the machines traveled. At 6:30 this morning the crowd began to line up along the road. At 7 o'clock sharp the first car, a Moon driven by Knox, was given the gun and the race was on.

Smith, in his Mercer, followed after an interval of a minute, with Alexander in a Buick barking loudly behind him. Burman, in his heavy Benz, was the next driver to leave the starting point. Louis Nikrent, in a Buick, with Janette in another Benz, were next. A National, Ford, Stutz and another National were sent away a minute apart. Carlson in his Stutz, Hill in a Fiat, another Buick and a Columbia car completed the list of cars to get away.

SAVANNAH AWARDED THE CLASSICS

New York, Jan. 6—Savannah was awarded the running of the next Vanderbilt cup and grand prize races at a meeting of the Motor Cups Holding Co. today. The races will be staged on approximately the same course as in 1911. It is likely that it will be slightly shortened but will be about 14 miles in length.

Savannah Gets Classics—Milwaukee Will Run Pabst Cup Event

The races will be run some time between November 1, 1913, and February 23, 1914, but according to Henry Sanderson, of the contest board of the Automobile Club of America, it is likely that they will be staged about Thanksgiving day as usual.

No other applications for the races were formally considered although it was stated that the New York dealers and the Milwaukee Automobile Dealers' Association sought to secure the races.

A large delegation from Savannah, representing the local club and various civic organizations, waited upon the cup committee and presented the claims of the southern city.

REBELLION THREATENS ON COAST

Los Angeles, Cal., Jan. 4—The Western Automobile Association has been formed here and at a meeting today Frank Garbutt, Frank Young, E. E. Hewlett, R. A. Rowan, E. Y. Boothe, W. E. Bush, W. J. Lacasse, J. S. Mitchell, Will Garland and Leon Shettler were elected directors. It is stated that the new organization will refuse to recognize the jurisdiction of the American Automobile Association and that it will devote itself to handling motoring matters on the Pacific coast. Whether or not it will get any support outside of Los Angeles is not known, but it is stated that both San Francisco and San Diego have refused to come in.

The suspension of Teddy Tetzlaff by the A. A. A. contest board for driving in an exhibition at an unsanctioned meet is said to have brought matters to a head and caused the revolt. Both Tetzlaff and Barney Oldfield have secured driving licenses from the Western Automobile Association and they are billed to drive a match next Saturday which will not be sanctioned by the A. A. A.

MILWAUKEE TO RUN PABST CUP

Milwaukee, Wis., Jan. 7—The reported action of the Motor Cups Holding Co. in ignoring Milwaukee and awarding to Savannah the grand prix and Vanderbilt cup road races, has aroused the local promoters, who are considering several courses of action to pursue in case the Savannah award is officially confirmed. In case Savannah gets the classics the Colonel Gustave Pabst trophy will be raised to a position of eminence as a road racing prize by the Milwaukeeans.

A prize of $7,500 or even $10,000 accompanying the Pabst trophy is not an impossibility, for early this morning, when press reports gave Savannah the old classics, there was a stir and bustle in Milwaukee which resulted in a flood of bona fide offers from the most substantial business men. Milwaukee will get together with Elgin just as soon as the rush of the Milwaukee motor show is over and frame up fall dates.

STUTZ ENTERS 500-MILE RACE

Indianapolis, Ind., Jan. 6—To the Ideal Motor Car Co. of this city belongs the honor of making the first entries for the 500-mile sweepstakes to be held on the Indianapolis motor speedway Memorial day. Two Stutz cars have been entered and Charles Merz and Gil Anderson nominated to drive them.

The speedway management has announced that the prizes for the 500-mile event will aggregate $50,000, the same as last year, but that they will be divided among ten drivers instead of among twelve drivers, as in 1912. The prizes will be as follows: First, $20,000; second, $10,000; third, $5,000; fourth, $3,500; fifth, $3,000; sixth, $2,200; seventh, $1,800; eighth, $1,600; ninth, $1,500, and tenth, $1,400.

Homer McKee has resigned as publicity manager of the speedway. Mr. McKee is advertising director and sales director of the Cole Motor Car Co., and has found it will be impossible to devote time from these duties to the speedway. His successor as publicity manager of the speedway is Paul R. Martin.

NEW YORK INCREASES SPEED LIMIT

New York, Jan. 6—Increasing the speed limit for motor cars to 15 miles an hour and increasing the penalties for violating the law, the aldermen of New York have passed an ordinance doing away with the ancient law that made 8 miles an hour the speed limit in New York. On certain much used motor thoroughfares of Harlem and the Bronx the limit is set at 18 miles an hour. In certain highways in Brooklyn, Queens, 20 miles, and in country districts, 25 miles. The old law has been a dead letter almost from the time of its enactment and much uncertainty existed in the minds of the general public as to traffic rights.

Offenders are to be punished on a graduated scale. For first offense the penalty is a fine of $25 to $100 or 15 days in jail, or both; second offenders within a year, fine $50 to $100 or 30 days, or both, and for third and subsequent offenses, $100 fine or 60 days, or both. Owners riding in motor cars at the time of breaking the speed law are deemed liable to punishment provided for misdemeanors. The law goes into effect March 1. The vote upon it was unanimous. Fire and police motor cars, United States mail vehicles and ambulances are expected.

Hoosiers Announce Plans for Long Tour

Start for Pacific Coast to be Made From Indianapolis July 1

INDIANAPOLIS, IND., Jan. 6—Eight o'clock on the evening of the first of next July, Indiana's great motor tour to the Pacific coast will leave this city. So definitely are the preparations being made that even the time of the departure can be announced.

At its recent meeting the Indiana Automobile Manufacturers' Association adopted the plans proposed for the big journey from the Hoosier capital to either San Francisco or Los Angeles. It will be a pathfinding expedition for the great rock road which some day will extend from the Atlantic to the Pacific oceans, and for hundreds of tourists who yearly travel across the continent. Not only did they heartily approve of the general route and the details, but they also supported this by the definite promise of the entry of twenty-six cars.

Fireworks, bombs and characteristic Hoosier enthusiasm will have full sway at the start. For 65 miles that evening the tourists will run due west to Terre Haute with the Hoosier Motor Club as an escort. Features of a similar nature will be a part of the affair for the 25 days during which the motorists will be en route.

The only points which are sure of being on the itinerary are Indianapolis, St. Louis, Kansas City, Denver, Salt Lake City, San Francisco and Los Angeles. Between these points there are choices of directions which are being investigated. For example, from Kansas City to Denver the tourists might go direct through Topeka or turn northward through Omaha. From Denver to Salt Lake the route accepted at present is via Cheyenne and Laramie, but Colorado boosters are strongly in favor of sending their Indiana visitors through the scenic highway of the Rockies, directly west to the Utah line.

Two Divisions Planned

There will be few rules to govern the tourists. Two divisions will be maintained, one for passenger cars and one for commercial vehicles. All will be entered by Indiana car or accessory manufacturing concerns and each company will be limited to not more than three cars in either or both divisions. The general regulations which have been so successful in the two previous Indiana tours will again be in vogue. It will not be a contest, but is intended to show the product of Indiana concerns in the nine states through which they will pass. In fact, the party will make a short stop in every important town along the route.

From Indianapolis to Kansas City the tourists will sleep in hotels, but after entering the Sunflower state, the nights will be spent in organized open camps, with the exception of the stops in Salt Lake City and Denver. Special sleeping arrangements are being suggested by some makers, while others will carry lightweight regulation tents. It is likely that a regular army quarter-master and four cooks will be employed for the month to insure proper commissary service. Their equipment will consist of four fast trucks, one for the kitchen, two for supplies, and one for breakfast. Each morning the first three will make an early start, while the breakfast truck will bring up the rear.

Good Chance for Trucks

Commercial vehicle manufacturers are seeing enormous possibilities in the tour, for demonstrating their products. In addition to the four in the commissary squad, it is known that two will carry general supplies, such as extra gas, water and oil, materials for strengthening bridges, a large winch and tackle, confetti, etc. Still another will carry tire equipment and an electric vulcanizer. One will have a complete electric lighting system and wireless telegraph outfit of sufficent strength to keep the tourists in touch with Kansas City, Denver, Salt Lake City, or San Francisco, while they are camping on the plains.

The party probably will remain in San Francisco for 3 or 4 days, and then tour southward to Los Angeles. The further possibility has been suggested of shipping all of the tour cars from Los Angeles to Portland by boat. A visit to the great northwest therefore is contemplated.

ROAD BILL FOR ILLINOIS

Springfield, Ill., Jan. 4—The good roads committee, appointed by the last legislature, has completed a draft of the measure that will be offered at the next session of the solons. It purposes to abolish the present 4,800 separate taxing and administrative units that now control highway improvement in the state; provides for state aid and the appointment of a highway commissioner; permits the employment of convicts for preparing road material and also working on the highways; provides for all motor registration fees and fines being turned over to the highway commissioner for road improvement and construction; gives county boards the right to control the letting of rights to public utilities, and states that a uniform system of constructing and maintaining highways shall prevail.

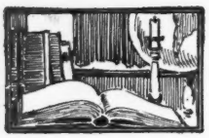
Accident Responsibility Placed on Manufacturers

PARIS, Dec. 27.—In the case of the breakage of an important part of a motor car, involving personal injury, the manufacturer is responsible, and not the person from who the car was hired, according to a decision just handed down by the Paris court of appeals.

The decision arose out of a claim made by Mr. Strowbridge, of Philadelphia, for $100,000 *damages for injuries received while touring in a car rented from the Société Routière. Three years ago Mr. Strowbridge was touring through the Pyrenees in a car hired at the rate of* $35 *a day, when, on passing through Noret-de-Marsan, he was thrown out of the car and seriously injured owing to the jamming of the steering gear.. As a consequence of the accident Mr. Strowbridge had to have both legs amputated. The court in the first instance awarded Mr. Strowbridge* $14,000 *damages against the hiring company, refusing to admit the plea that the manufacturer was responsible. In the judgment it was stated that it was the chauffeur's duty to constantly supervise the steering geer.*

In the court of appeals this decision was amended, the judgment being given that the manufacturer was responsible for any constructional defect, and that the chauffeur, not being an engineer, must rely on the proper initial construction of the car. Therefore the manufacturer of the car, and not the hiring company, was ordered to pay $14,000 *to Mr. Strowbridge.*

This decision is one of considerable importance to motor car manufacturers for they have always claimed that their responsibility was limited to the changing of any provedly defective part. Such a clause is incorporated in practically every sales contract drawn up in Europe. The car having been hired in this case, the client had not signed any document releasing the maker from responsibility for personal injury.



The Readers' Clearing House

Installing Electric System

Motorist Contemplates Improvising Lighting System But Is Not Sure of His Ground

ROCK Island, Ill.—Editor Motor Age—I would like some information regarding an electric lighting system which I am considering putting in my car. I have a small generator, made by the Nativity-Sleeper Co., Fowler, Ind., that I have mounted on the sub-frame of my car, and am running off the flywheel by friction. I have been told that it is a 6-volt generator, but have been able to get as high as 10 or 12 volts, according to a voltmeter. I want to use it in the day-time with which to charge a storage battery, and use the battery to light two 16-candle-power headlights, a dash light and tail light, as well as ignition for starting, if possible. The battery I have is a 6-volt Exide, taken from a Chalmers car. Will the generator charge this battery, and is the battery large enough to care for the duties I have planned for it, even for a short time? One party told me to have the generator run at night too, and go through the battery, but I thought if the generator was run fast enough at some times as it will it may have an output of say, 8 or 9 volts, and that this high voltage may go right through the battery and burn the lights out, as they are only 6 volts. Am I right, or will the storage battery keep the surplus, and only give the lights 6 volts.—Will Glenn.

In the first place, you have not stated the output of the generator, either in volts or amperes; you have not specified the capacity of your battery in amperes, or the capacity of your lamps in amperes, nor do you give the normal speed of your generator. Evidently you do not know whether the generator is direct-current or alternating, and you have made no provision to prevent over-speeding of the generator, overcharge of the battery, or exhaustion of the battery back through the generator when the latter is running slowly. If you go ahead and attempt to rig up a lighting system under such conditions, and with such an equipment, you probably will ruin the generator, the battery, and burn out the lamps.

The first thing to do is to write the manufacturers of the dynamo for full particulars, including the volts, amperes and speed at which the dynamo is designed to operate. Next, with this data determine the speeds between which the generator may be safely allowed to run in circuit with the generator. Then fit a governor of some sort to prevent over-speeding of the dynamo, both for its sake and that of the battery. Fit a low-speed cut-out to the circuit, to break the circuit when the output of the generator is too low to cause the current to flow from the generator to the battery. If a governor is used to prevent over-speeding, it also may be used to break the circuit at low speeds. Next, totally disregarding the battery, find the size of lamps that will burn on the normal output of the generator. With this data, choose a battery of the same voltage as the generator and lamps, and a sufficient capacity to maintain the lamps for several hours when the engine is not running. If your generator is not direct current, the storage battery cannot be used.

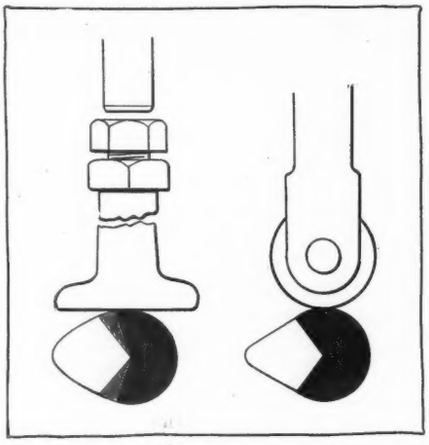


FIG. 1—EXAGGERATED DIAGRAM OF CAM DIFFERENCES WITH ROLLER AND MUSHROOM-TYPE LIFTERS

ETHER FOR MOTOR STARTING

DETROIT, Mich.—Editor Motor Age—Having seen a number of requests lately in Motor Age regarding the action of ether as a primer for starting in cold weather it may be of value to Motor Age readers to know that I have used for this purpose for the past 7 years a mixture of one-half gasoline and one-half commercial or washed ether. The mixture is placed in an ordinary ½ pint oil can with a cork over the tip when not in use. I squirt about ¼ ounce of the mixture into each priming cup and never have known any motor to fail to start with one-quarter turn of the crank, that is, one pull up. I have had the motor occasionally start on the spark even in very cold weather. I have had absolutely no bad effects from its use in any way. Contrary to a popular impression ether does not cause abnormally high pressures in the cylinders. The washed ether costs 35 cents per pint at wholesale druggists and comes in sealed tin cans. Two pints will usually last me through the winter.—Edward T. Birdsall, M. E., consulting engineer.

Types of Valve-Lifters

Explanation of Features and Comparison of Action of Bearing Ends of Push-Rods

DENVER, Colo.—Editor Motor Age—It has been contended that a roller actuated valve lifter will give a greater valve opening than the mushroom type of valve lifter, and consequently the highest efficiency and most power, assuming that both open and close an equal number of degrees. Will Motor Age give its opinion regarding both types of valve lifters?—Peterson Bros.

Valve-lift is a matter of camshaft design, and is very accurately gauged. A given design calls for a certain valve-lift, which will be used in the engine, whether the roller or mushroom type of valve lifters are used. The roller type of lifter is used because there is less wear, and therefore the play need not be so great as with the mushroom or friction type. The roller is in contact with the cam during its whole travel, so that there is no hammering of the valve stems, but a constant pressure instead. However, the advantages of roller lifters go farther than this, for by the elimination of a large amount of play the cam does not kick up the lifter until the time of valve-opening and drops it as soon as the valve closes, the valve opening being more positive than where it is suddenly thrust open, and then allowed to spring back. In other words the lifter follows the full contour of the carefully cut cam, and derives the full benefit of the nicely calculated curve. The mushroom tappet, on the other hand, owing to its greater necessary play, only employs a part of the cam in actual valve action, the rest being employed in taking up lost motion. The result is that the cam that is intended for mushroom lifters should be slightly more blunt or convex than that for the more sensitive roller type, in order that it may open quickly, stay wide open as long as possible, and close suddenly. The other type takes the cam later, and lifts it gently to the ideal peak of the cam, and lets it down gently. The difference in the action of the two types is shown in Figs. 2 and 3, while the effect on the cams is illustrated in Fig. 1. Of course the actual timing of the valve opening is the same with both types, but only the actual valve opening is cut on the cam that is to be used with the roller type of lifter, while with the mushroom lifter the eccentric portion must also be cut to take up the play before and after the actual valve opening.

It cannot be said that any more efficiency or power can be derived from a

roller lifter than from a mushroom type, provided that tappets of the latter type are in proper adjustment. But right here comes the difficulty. The friction type of cam wears and consequently requires adjustment more often than the roller type, and in the hands of unskilled or careless drivers are likely to suffer from lack of attention, with the result that the valves will not open as wide as they should, or as early, or stay open as long. In the hands of a reasonably careful driver, though, the only practical advantage of the roller type over the mushroom type is in silence and longer life.

FOREIGN AND DOMESTIC DESIGNS

Ogdensburg, N. Y.—Editor Motor Age—In a past issue of Motor Age it was stated that de Palma's Mercedes had no direct drive. Kindly explain its gearbox in its variations from the orthodox, or any other unique features in the matter of drive that are incorporated in this machine; and if you have done so in any previous issue which has escaped my notice, refer me to the information.

2—I have never noticed a full discussion in Motor Age of the transverse cardan system of final drive, such as de Dion uses. My queries on this matter are quite general, and I would prefer not to ask questions if I could hope for a more or less full discussion of the subject in an article. It must, of course, have a history, and many good as well as bad points, besides those that are obvious at a glance. The use of this system of final drive on the large de Dions and on the Roland-Pillain for many years seem to justify me in considering it a subject of considerable interest and importance and quite worthy of an article dealing with it, especially so, considering the ignorance of a great many Americans of the very existence of such a final drive.

3—Why is there so great a tendency nowadays to so design motor cars that the steering connecting rod becomes very short? I have noticed this tendency on most of the late designed foreign and American cars, and it seems to me undesirable, because of the way the front wheels wobble whenever there is any perceptible spring action. This effect is increased on many cars by having the connecting rod in a non-horizontal position under normal load, resulting in greater deflection of the front wheels for the same spring action. Of course, even with a long rod, there is a certain amount of deflection of the front wheels when the front springs act, but it is quite negligible. But watch a car with a short connecting rod coming towards one over a rough pavement, and the wobble is certainly alarming. Is it not too great a price to pay for a raked column, an institution, by the way, that seems to have attained a popularity far beyond its due? I came to that conclusion this past summer while trying to make time over a sandy road of uneven surface, where everything was all right so long as the wheels traveled along the ruts, but where one was almost brought to a standstill when they would wobble off crossways.

4—What has the rotary valve motor, described in Motor Age recently as an Itala patent, developed into? It seemed to be a very simple and practical valve. Also, how has the Argyll single-sleeve come on, and the Darracq rotary valve?—Old Subscriber.

1—Motor Age at no time has made the statement that de Palma's Mercedes had no direct drive. In the table of specifications published at the time of the Elgin races, this feature was left blank in the table, owing to inability to obtain accurate information at the time. De Palma's car has a direct drive on the third speed, the fourth being geared up. There is no especial deviation from accepted standards in this gearbox.

2—The transverse cardan drive as used in the de Dion-Bouton was described and illustrated in the issue of Motor Age of December 19, 1912. It consists of a differential secured rigidly to the frame of the car, and driving to the rear wheels through flexible drive axles. The load axle is a light tubular dead axle, which supports all wheel load. The advantages are utter freedom from load stresses on the differential, the ability to dish and camber the rear wheels, the absence of angularity in the propeller-shaft drive and the minimum of unsprung weight on the rear axle. It was developed by the de Dion company as a compromise between the chain and orthodox shaft drive. While its good points are conceded, the sharp angularity of the transverse driveshafts and the employment of four universals has given rise to criticism of this axle. The angularity of the drive could be reduced by carrying the differential lower in the frame, with a resultant increase in stability, but the fact that other manufacturers have not taken it up as yet does not look favorable to its development. A modification of this system, which seems to be built along more rational lines, is the ultimate-drive rear axle, which was described in Motor Age in the issue of December 12, 1912.

3—There is little comment on your observation necessary. Manufacturers have been confronted with a demand for low body lines and rakish steering angles, and, in order to compete, many makers whose car was too short and too high to permit of such construction with safety, have none the less sacrificed their steering stability to popular demand. The remedy is not with the manufacturers, for the buying public demands low appearance, and the maker of small cars has but to bow to this demand.

4—The Itala and Darracq rotary valves are considered successful, as they have been retained by their respective makers. Being patented features, they are of course exclusive with their patentees. The Argyll single-sleeve motor has not progressed appreciably, but is still retained in the larger models. It is also used on the Pic-Pic.

NOTICE TO CORRESPONDENTS

Motor Age has received communications addressed to the Readers' Clearing House from the following named towns and nom de plumes:

Regina, Sask.—A Beginner.
Oakland, Cal.—J. A. H.
Neche, N. D.—Subscriber.
Strong, Colo.—A Subscriber.
Jefferson, Wis.—A Reader.
Harvey, Ill.—B.
Milwaukee, Wis.—Reader for Years.
Oak Grove, Ala.—A Subscriber.
Milwaukee, Wis.—A Milwaukee Chauffeur.
Canton, Miss.—Subscriber.
Indianapolis, Ind.—E. E. J.
Mexico, Mo.—Subscriber.
Gulfport, Miss.—S. G. E.

These communications will be held until the proper signatures have been received. All communications written over a nom de plume must bear the writer's signature, otherwise such communications will not be answered. These signatures are wanted as proof of the authenticity of the inquiries.—Editor Motor Age.

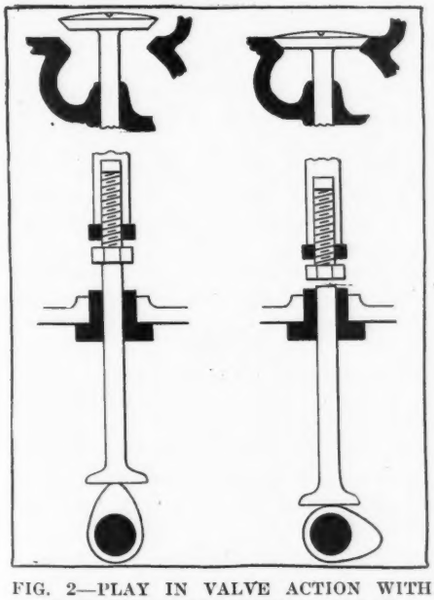


FIG. 2—PLAY IN VALVE ACTION WITH MUSHROOM-TYPE LIFTERS—GREATLY EXAGGERATED

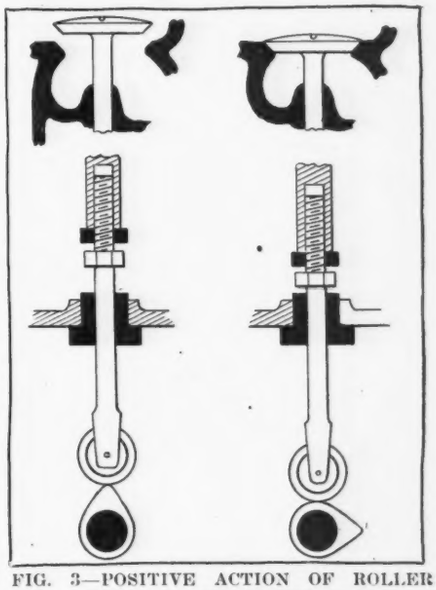


FIG. 3—POSITIVE ACTION OF ROLLER LIFTERS, IN WHICH THE PLAY IS NEGLIGIBLE

The Realm of The Commercial Car

Parcels Post in Practical Operation

Government Inaugurates Service Which Furnishes Competition for Express Companies—Test Made Shows Uncle Sam Is Fleet of Foot in Delivering Packages—Some Amusing Incidents in First Day of Operation

ALTHOUGH as yet the motor car does not figure very largely in the operation of the parcels post delivery, inaugurated January 1 by the government, still the industry cannot help but be interested because of the possibilities the future holds. As soon as the government gets the system in good working order, which will not be long, it is thought, the motor industry will be in a position to figure out these possibilities and prepare to furnish trucks and light deliveries.

With the success of the new parcels post assured by the events of the first few days of its use, a new transportation has been born, destined to become a vast system of delivery covering the entire country, handling tons of merchandise a day, delivering house to house in every city and to rural communities, and employing for the work a large number of motor vehicles.

At the present stage of the parcels post the public is amused by its novelty and seems to take it as a new kind of amusement, but with the passing of the novelty of the system will come the serious aspect of increased business facility and a more efficient delivery of medium-sized parcels. It is a possibility that the parcels post system will double the amount of matter handled by the government in its mailing systems.

Tests Made in Chicago

Tests made by the Chicago Tribune show that in the majority of cases the mails are quicker than the express companies. The Tribune posted twenty packages at 1 minute after 12 o'clock New Year's morning, the moment of the inauguration of the system, these being of various sizes and one to every zone of the parcels post system. At the same moment twenty similar parcels were given to the express companies for delivery to the same addresses. In each package was the request for a wire immediately on receipt of the package. Out of all packages heard from seventeen arrived first by parcels post, and but three by express.

The list herewith gives the cities to which the packages were sent, the postal rate and the express rate, these figures giving a good idea of the relative cost of the two systems. Though figured from Chicago the cost comparison is a good average one. The list is as follows, showing the competing rates:

	Zone	Express Rate	Parcels Post Rate
Buffalo, N. Y.	4	$0.25	$0.14
Fort Worth, Tex.	5	.25	.09
Milwaukee, Wis.	2	.25	.10
Boston, Mass.	5	.25	.09
St. Louis, Mo.	3	.25	.07
Minneapolis, Minn.	4	.25	.08
Tampa, Fla.	5	.30	.09
Toledo, O.	3	.25	.07
Fort Dodge, Ia.	4	.25	.08
San Francisco, Cal.	8	.30	.12
Cincinnati, O.	3	.25	.07
Des Moines, Ia.	3	.30	.12
Washington, D. C.	4	.25	.08
Washington, D. C.	4	.25	.26
Cleveland, O.	3	.25	.17
San Antonio, Tex.	6	.35	.19
Seattle, Wash.	7	.60	.21
Atlanta, Ga.	4	.35	.14
Kansas City, Mo.	4	.55	.14
New Canaan, Conn.	5	.25	.09
Emporia, Kans.	4	.25	.08
Totals		$6.25	$2.48

A test conducted in the east gave the express a slight advantage. A package sent from Washington to the New York World by express arrived 27 minutes before a similar bundle send by parcels post.

A number of enterprising firms used the new delivery for unique purposes while many took advantage of the new possibilities to playing jokes on their friends.

A Gary, Ind., brick manufacturer deposited 6000 bricks in the mails and thereby obtained publicity enough through newspaper comment to pay for many more thousands of bricks.

The first parcel post package was received by President-elect Wilson. A Princeton political club mailed a package of apples to Governor Wilson at midnight. By previous arrangement the regular letter carrier to the Wilson home was on hand and immediately carried the packages to its destination by speedy motor car, delivering it to the president-elect at just 12:04.

Dog Sent by Post

A nameless brindle bulldog had the distinction of being the first canine that ever travelled by post in America. He was delivered by post to a resident of Yonkers, N. Y.

The first package received at Omaha contained 2 dozen eggs—nicely scrambled.

A coffin was sent through the mails from the Zanesville, O., postoffice, the cover forming a separate package. It is reported that nearly all of the downtown department stores of San Francisco delivered by parcels post the day of its inauguration.

A horned owl made its appearance at the Chicago postoffice on January 2 en route by parcels post.

It will thus be seen that the possibilities of the new system are wonderful as allowing almost any kind of package under 11 pounds to be delivered. Books are excluded however. In response to the new system express rates on many classes have been more than cut in half to meet the government competition.

Some Regulations

Packages cannot be deposited in the corner mailbox from now on as formerly. To prevent confusion tags were attached to Chicago package boxes reading as follows: "This box for printed matter only. All merchandise requires parcels post stamps and must be mailed at postoffice or carrier station."

Packages may be insured up to $50 value for 10 cents extra.

All of the novelty and all of the public interest is bound to develop this new way of sending small packages into a big business which, for its carrying on, will demand motor trucks and delivery wagons in large numbers. Forty-eight thousand dollars worth of parcels post stamps were sold in Chicago on January 2, as an indication of the parcels post's importance as a new line of trade.

It is probable that the house delivery of parcels will eventually be handled by motor vehicles entirely, delivering even on rural free delivery routes.

TRI-CITIES INTERESTED

Postmasters H. A. McDonald, of Rock Island, Ill.; A. T. Foster, of Moline, Ill., and S. A. Finger, of Davenport, Ia., are working upon a project to establish motor collection and transfer service in the tri-cities. The postmasters hope to secure an allowance of $12,000 for the three cities to be used in the purchase of six motor cars. It is proposed to use the machines for local collection service and the exchange of mail among the three

cities. A car, under this plan, will make three trips daily to each city and, when not so engaged, will be used in collecting for its home office. The plan will not only greatly improve the local collection service, but remove the present cause for complaint in the slow handling of mail between the three cities. At present, although the three cities are but a mile apart, it takes as long, in frequent instances, to carry a letter from Moline to Rock Island as it does from Moline to Chicago.

BALTIMORE HAS MOTOR BANK

Bartimore enjoys the distinction of having the first real motor bank, the machine being operated by the German-American Bank of that city. The body of the machine was designed by the Zell Motor Car Co. The chassis is of the regular Chalmers delivery car type and the motor is 30 horsepower, giving ample power for hill-climbing and speed. The body is of wood, but has a lining of steel, sides, floor and roof. Within there is 6 feet headroom and 7 feet 6 inches of length. Ample desk space is provided by a hardwood counter and the necessary drawers and safe built across the entire width of the body. Light is obtained from two windows in the rear, fitted with grills similar to receiving tellers' windows on each side. A revolving desk chair is securely fastened to the floor of the car and placed in such a position that the teller can turn around from his desk and receive deposits from the pay windows.

Entrance to the interior is gained from the left hand side of the driver's seat. A sliding door opens half way across the width of the body. The driver's seat is built in a stationary manner only the width of the solid partition which partly divides the driver's seat from the interior. A folding seat lets down in front of the sliding door in case the clerk on the inside should have use for it. An electric dome light has been placed in the roof of the banking department to provide artificial light on dark days.

The painting of the body is unique in that it has the appearance of entirely being made of steel. Its resemblance to burnished bronze is so closely carried out that a carriage and wagon builder declared for certain it was metal and not wood.

WISCONSIN POSSIBILITIES

The introduction of the parcels post system on January 1 will mean that many postoffices in Wisconsin which heretofore have depended upon men or horses to haul mail will begin the use of motor cars in the postal service. Milwaukee has had motor postal service for 7 years or more, and was so well equipped that the parcels post makes no further additions of mail cars necessary. However, Superior, Oshkosh, Racine, Kenosha, Madison, LaCrosse, Sheboygan, Manitowoc, Green Bay, Marinette, and other cities of the second class, are now figuring on mail motor cars. Oshkosh already has placed in service a motor

car with ordinary delivery body, and will add three more before the end of the year. The system used at Oshkosh is the same as at Milwaukee, where the use of the cars and drivers is leased from private parties by the government for a certain term, during which the contractor must guarantee to have cars and drivers on hand for service at all times as required by the lease.

One of the largest and most extensive patrons of the parcels post in Wisconsin since its very introduction is the secretary of state, John S. Donald, who is effecting a saving of 50 per cent in postage on motor car license plates under the package post system. To mail a set of two plates to an owner cost 12 cents under the ordinary postal classification, but now the cost is but 6 cents. On 25,000 sets of plates, which is the minimum issue anticipated for 1913, the saving will amount to $1,500. This amount will pay for the hire of an extra clerk, which has been needed since the annual registration law became effective but could not be done because of an insufficient appropriation.

MILWAUKEE READY

Postmaster David C. Owen, of Milwaukee, states that the establishment of the parcels post on January 1 will not require any additional vehicle service in the city of Milwaukee, nor will the additional burden of heavy mail cause any particular inconvenience, because of the excellent motor mail service Milwaukee has had for 7 years. In this connection it is interesting to note that Milwaukee was the first city in America to employ motor-propelled mail delivery and collection cars and Mr. Owen is the originator of the idea, as well as being the designer of the type of body now so generally used by all of the large cities of the country for the service.

Seven years ago Mr. Owen conceived the motor mail car idea and with the engineers of the Johnson Service Co., of Milwaukee, brought out a half-dozen cars, which after a successful trial, were leased by the government for 4 years and released at the expiration of that period. Ten cars are used in the collection service and eight for delivery within the Milwaukee city limits, and Mr. Owen believes that the equipment is sufficient to take care of all parcels post burdens for several years to come, at least.

The cars are leased, with drivers, from the Johnson Service Co. by the postoffice department at an annual rental and under a strict guarantee and penalty clause which assures the Milwaukee postoffice of sufficient cars, competent drivers and perfect service at all hours of the day or night, as needed. The Johnson company maintains a reserve fleet for emergency purposes. Some of the mail cars now in use have been doing service daily for more than 6 years.

The Columbus, O., postoffice has arranged for a motor service for deliveries in the new parcels post system. Postmaster Krumm has arranged for one car to take up the service at the beginning but the number will be increased as occasion demands. It is believed a half-dozen cars will be necessary to take care of the business of the Columbus postoffice within 6 months.

Long Motor Hike for Soldiers Planned

A PLAN for transporting the Twenty-third United States infantry from Fort Benjamin Harrison, near Indianapolis, to the Pacific coast and return during the summer of 1913, using motor trucks for the trip, has been worked out by Colonel Edwin F. Glenn and other officers of the regiment. The plan is to be submitted at once to the experts of the war department for consideration and if it meets with their favor, congress will be asked to appropriate $450,000 for the experiment.

Colonel Glenn has long held a theory that the motor truck, in the very near future, is to take an important part in the mobilization of troops and in actual warfare. He believes the experiment to be proposed would be well worth the cost involved, if it would establish the unquestionable efficiency of the motor truck for army work.

According to the plan worked out, it would require 140 motor trucks for the trip and it is estimated the regiment could advance at the rate of 60 miles a day. The average daily march for infantry on foot is 15 miles and for cavalry 25 miles.

Colonel Glenn believes each truck could carry two squads, consisting of fourteen privates, two corporals, one sergeant and a driver, together with their necessary equipment and baggage. Additional trucks would be required for hauling gasoline, oil, tires, spare parts and other necessary things.

It is estimated that if a regiment were equipped with motor trucks, and internal strife developed within 600 miles of an army post, the regiment could reach the scene in much less time than it would require to assemble a railway train and transport the troops in this manner.

Statistics of the war department show it costs $1,080 a day to maintain a cavalry regiment on march, at 25 miles a day. It is estimated a regiment using motor trucks could be maintained for $620 a day and cover 60 miles.

From the Four Winds

MINNEAPOLIS, Club Moves—City headquarters for the Automobile Club of Minneapolis and of the Minnesota State Automobile Association have been moved to the Hotel Radisson.

Big Order for Road Material—One hundred thousand barrels of cement and 85,000 cubic yards of gravel and sand are the requirements of County Highway Commissioner H. J. Kuelling, of Milwaukee county, for 1913 permanent highway work in Wisconsin under state aid.

Penn's Count for 1912—During 1912 the motor car division of the Pennsylvania state highway department issued 59,365 licenses, the highest number known since the establishment of the bureau. The licenses represent an income of $598,000. In 1911, 44,272 cars were licensed. The 24,000-mark in 1913 licenses was reached this week.

Fast Run by Electric—From New York to Boston, over hilly roads and with three detours over mud roads, 251 miles in 12 hours and 15 minutes is the record claimed for a Church-Field electric roadster. The best previous record for an electric car between the two cities was 12 hours 12 minutes for a distance of 224 miles. The detours made by the Church-Field account for the discrepancy in mileage.

Michigan's Road Appropriation—Michigan will spend more than $2,000,000 on roads in 1913. The total amount of bonds already allowed is more than $900,000, while Wayne county will spend $100,000 or more of the bonds already authorized, and Kent, Genesee and Ottawa will use like amounts. Delta county has voted $100,000 and Berrien undoubtedly will bond for half a million at the spring election. Many townships have bonded for small amounts.

No Change in Canada's Speed Law—Motor cars will not be permitted to increase their speed or to travel any faster than 9 miles an hour in cities and villages and 15 miles an hour in the country districts in Canada. This was decided on by the lower house, when it accepted the amendment to the government bill as proposed by Mr. Mackenzie, who declared that he withdrew the clause authorizing an increase of speed in cities to 15 miles an hour, and in the country to 25 miles an hour, in deference to public opinion and protests which had been forwarded to the government. The effect of the amendment is the existing speed regulation remains unchanged. Other clauses which remain in the bill regulate the approach of a motor car to a street car which is standing still for taking on or letting off passengers. The motor car must not pass a standing car. The bill also provides that municipalities may set aside certain roadways on which motor cars may travel at a higher speed for the purpose of trial trips or tests.

Means Much for Tourists—A report issued by the highways commissioner for the province of Manitoba shows that a sum of over $1,000,000 will be spent during 1913 on the highways of the province. The work will all be carried out under the supervision of the government engineers so as to insure a uniformity of character in the construction of the new highways. One of the main traveled highways which will receive the greatest attention is that portion of Canadian territory between Winnipeg and the United States boundary line at Emerson. This will mean that tourists from the states will be able to enter Canada from this point over a good highway and will have the effect of opening up western Canada and the Rocky mountain region to the tourists who heretofore were deterred from making the trip by the bad gumbo roads which existed on the roads between the boundary line and Winnipeg.

Coming Motor Events

MEETINGS

January 14-16—Motor and Accessory Manufacturers' meetings at New York.
January 14-16—Society of Automobile Engineers' meetings at New York.

SHOWS

January 2-10—Importers' Salon, Hotel Astor, New York.
January 4-11—Cleveland.
January 4-11—Montreal.
January 11-18—New York pleasure car show; Automobile Board of Trade; Madison Square Garden and Grand Central Palace.
January 11-18—Milwaukee, Wis.
January 11-22—Brussels, Belgium.
January 20-25—New York truck show; Automobile Board of Trade; Grand Central Palace and Madison Square Garden.
January 18-25—Philadelphia pleasure car show.
January 21-26—Toledo show.
January 25-February 1—St. Johns, N. B.
January 25-February 1—Providence, R. I.
January 25-February 1—Montreal, Canada.
January 27-February 1—Rochester, N. Y.
January 27-February 1—Ottawa, Ont.
January 27-February 1—Scranton, Pa.
January 27-February 1—Detroit.
January 27-February 1—Buffalo, N. Y.
January 27-February 1—Philadelphia truck show.
February 1-8—Chicago pleasure car show; National Association Automobile Manufacturers.
February 3-8—Washington, D. C.
February 10-15—Chicago truck show.
February 8-15—Hartford, Conn.
February 10-15—Minneapolis.
February 12-15—Geneva, N. Y.
February 15-22—Newark, N. J.
February 15-22—Albany, N. Y.
February 16-23—Richmond, Va.
February 17-22—Kansas City pleasure car show.
February 18-19—Madison, Wis.
February 18-21—Grand Forks, N. D.
February 19-23—Topeka, Kans.
February 19-23—New Orleans, La.
February 20-22—Canandaigua, N. Y.
February 24-March 1—St. Louis, Mo.
February 24-March 1—Memphis, Tenn.
February 24-March 1—Cincinnati, O.
February 24-March 1—Omaha, Neb.
February 24-27—Kansas City truck show.
February 26-March 1—Fort Dodge, Ia.
February 26-March 1—Glen Falls, N. Y.
March 3-8—Sioux City, Ia.
March 3-5—Cincinnati commercial show.

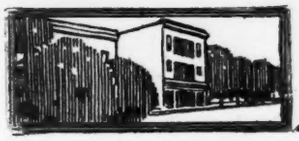
Hanson Makes New Year's Century—In a Krit A. A. Hanson, of Minneapolis, did the first 1913 motor century in the northwest, starting at 12:01 January 1 and making 101 miles in 4 hours 22 minutes.

Boulevard for Detroit—In line with Detroit's proposed new city plan a boulevard 30 miles long, to extend from Connor's creek on the east side of the city north as far as Palmer park, then westward in a semicircle to River Rouge. Members of the commission have been quietly negotiating for land along the proposed boulevard. Some property owners have offered to deed land to the city for nothing.

Ohio Has 63,129 Cars—When the state registrar of motor cars of Ohio closed his books for the year 1912 it was found that 63,129 cars had been registered during the year. This places Ohio third on the list of states, as New York and California are the only two to have more cars registered. The revenue of the office for the year was in excess of $300,000. State Registrar Shearer estimates that there will be more than 80,000 cars in Ohio in 1913.

Canada Has 21,920 Cars—The popularity of the motor car in Canada, and incidentally the prosperity of the Canadian farmer, is shown in the latest statistics. According to the figures, there are at present 21,920 motor cars in Canada, or about one car for every 323 inhabitants. The rate varies considerably in the different provinces, Nova Scotia having only one motor per 851 people, while in Alberta there is a car to every 125 inhabitants. British Columbia ranks next as a motoring province.

Uncle Sam Helping—Governor Harmon, of Ohio, recently received a letter from the postmaster-general and the secretary of agriculture advising him that the sum of $10,000 will soon be available from the federal government for use in Ohio for good roads purposes. The money comes under a new law enacted by congress on conditions that the state or its subdivisions add $20,000 to it. The money must be used in improving a stretch of roadway 50 miles long which is traversed by mail-carriers. State Highway Commissioner Marker was asked to choose the road and he suggested the old national pike between Columbus and Zanesville, if it should meet with the approval of the postmaster-general. It is thought there will be no trouble in raising the required additional funds for this road.



Among the Makers and Dealers

DEATH of Truck Maker—Milton D. Martin, president of the Martin Carriage Works, York, Pa., manufacturing the Martin commercial truck, died at his home in York December 31. Death was caused by spinal trouble.

F. E. Castle Resigns—F. E. Castle announces his resignation as president of the Castle Lamp Co., of Battle Creek, Mich., and while he retains his stock in the concern, he is no longer connected with that concern. His resignation was presented at a meeting of the board of directors held in Toledo, and J. N. Willys, head of the Overland company, was elected to take his place.

Pope a Bay State Concern—The Pope Mfg. Co., of Hartford, Conn., now is a Massachusetts corporation instead of a Connecticut one. At a meeting of the directors a short time ago the matter was discussed relative to making the change because there are so many Massachusetts residents who are stockholders of the company. The directors then met and voted to make the change and this has been done.

Somervell Herreshoff President—C. Stuart Somervell, until recently manager of the Lycoming Foundry and Machine Co., of Williamsport, Pa., manufacturer of motors, has become general manager of the Herreshoff Motor Co., of Detroit. Mr. Somervell will perform a part of the duties hitherto falling to Charles F. Herreshoff, chief engineer and vice-president, the office of general manager being a new one.

Detroit Concern Reorganizes—Through the purchase by Frank Bauer and P. M. Lewis of stock held by L. A. Young in the Durable company, manufacturer of leather for motor car purposes, the company has a new set of officers, as follows: President, Frank Bauer; vice-president, F. O'Brien; secretary-treasurer, P. M. Lewis. The Durable company will continue the manufacture of top straps, magneto boots, crossarm boots and other motor supplies.

Name Is Changed—The New Process Gear Corporation has been incorporated with a capital stock of $1,000,000, all subscribed. The new company has taken over the stock of the New Process Raw Hide Co. The reorganization and reincorporation, with the increase in capital, were deemed advisable because of the expansion of the business of the company. The new name is adopted because it defines better the line of manufacture in which the company is engaged. Originally the manufacture of rawhide gears was the principal business of the company. Now it makes both metal and rawhide gears, the production of metal gears being many times greater than that of rawhide. By the reorganization there is no change in the ownership of the company. The principal owners are Thomas W. Meachem and his sons, T. G. Meachem and J. F. S. Meachem.

Rubber Concern Sues—Suit has been brought by Constantino P. Dos Santos, of Portugal, against the directors of the defunct Mansfield Rubber Co., Mansfield, O., for $38,461.49 alleged to be due for para rubber bought by the concern. It is averred in the suit that false representations were made to R. G. Dun & Co. The petition states that the concern subsequently went into bankruptcy.

Franklin Increases Stock—The capital stock of the H. H. Franklin Mfg. Co. was raised from $300,000 to $1,000,000 at a meeting of the stockholders. The new stock consists of 9,000 shares of common stock of par value of $100 each and 6,000 shares of preferred stock, 7 per cent accumulative, of par value of $100 each. The increase in the common stock is made by a 200 per cent stock dividend upon the present capital stock.

Ill Health Forces Retirement—Owing to a nervous breakdown G. B. Aldrich, who has been general manager of the Dayton Auto Truck Co. since its inception 3 years ago, has tendered his resignation to become effective at once. Mr. Aldrich will leave for Florida, where he will spend the next 3 months, and upon his return will probably re-enter the commercial car industry, though he has no definite plans for the future. He still retains his holdings in the Dayton Auto Truck Co.

Will Make Engines—Park S. Florea, Orlando C. Forbes and Edward H. Habig, prominent business men of Indianapolis, have organized the Wizard Motor Co., which has been incorporated with an authorized capitalization of $50,000. A factory is to be leased immediately, and motors will be manufactured. The charter is also sufficiently broad to permit the manufacture of motor cycles. James L. Yarian has been engaged as factory superintendent, engineer and designer.

Lozier Denies Ford Rumor—A rumor has been in circulation for some months past to the effect that Henry Ford, of the Ford Motor Co., had acquired a stock interest in the Lozier Motor Co. H. M. Jewett, president of the Lozier Motor Co., in a recent interview regarding this rumor made the following statement: "Neither Mr. Ford nor the Ford Motor Co. ever has considered acquiring a financial interest in the Lozier company, nor has the Lozier company ever had any idea or intimation that at any time Mr. Ford or the Ford company were considering becoming interested financially or in any other manner in this organization."

Engler Promoted—W. B. Engler, for the last 3 years head of the engineering department of the General Motors heavy-duty gasoline truck plant at Owosso, Mich., has been promoted to the post of chief engineer of the General Motors Truck Co., with entire charge of experimental and development work.

Grossman Opens Foreign Branches—Emil Grossman, who had been visiting the Paris show, returned to New York December 27. Besides establishing a branch at London, Mr. Grossman made preliminary arrangements for a branch at St. Petersburg, Russia, and for the distribution of Red Head spark plugs in France, Belgium, Austria and Italy.

Promotions at Boston—Alvan T. Fuller, who has the Packard agency in Boston, has made Frederick C. Graves general manager of the company, and he has made Charles S. Henshaw, formerly manager of the New York branch of the Thomas, sales manager of the pleasure cars and Norman H. Halliday, recently manager of the Boston Thomas branch, sales manager of the truck department.

Joyce Quits Selden—James Joyce has resigned as sales manager of the Selden Motor Vehicle Co., which position he has held during the past 18 months. Previous to his association with this concern he spent 6 years with the Alco in the capacity of factory superintendent and sales manager. His earlier associations with the motor industry were with the Electric Vehicle Co., Hartford, Conn.

Hermes Company Formed—The Hermes Motor Co., of Cincinnati, has been incorporated with a capital of $30,000 by Albert Kleybolte, Powell Crosley, Jr., Charles Eissen and others. The concern expects to enter upon the manufacture of a six-cylinder car within the next few weeks. It is expected that the stock of the company will be increased in a short time to $100,000 or $200,000.

Decision Against Driggs-Seabury—In a case involving $20,000, the circuit court sitting in Findlay, O., affirmed the verdict of the common pleas court in the Driggs-Seabury Ordnance Corporation against the Findlay Carriage Co. in favor of the latter. The Findlay Carriage Co., it is said, ordered some $20,000 worth of iron castings from the defendant corporation of Sharon, Pa., for the manufacture of auto cars. The castings were not delivered on time and the carriage company was compelled to seek what it wanted elsewhere. Later when the Sharon company delivered its goods payment was refused.

Development Briefs

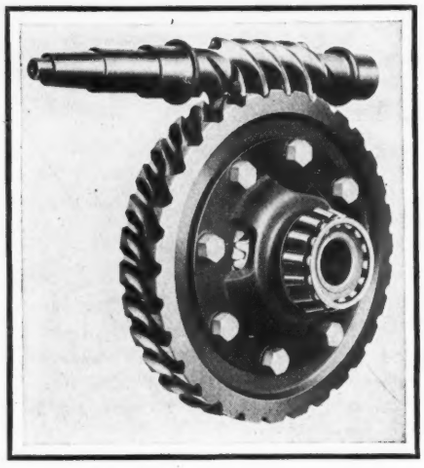


FIG. 1—TIMKEN-BROWN WORM AND WHEEL

DAVID BROWN straight-type worm-drive axles are to be manufactured in America by the Timken-Detroit Axle Co., of Detroit, which will use Timken roller bearings and worms and wheels made by David Brown & Sons, Huddersfield, England. The axles will be handled in America by the Timken-David Brown Co., of Detroit. Two principal types will be turned out; one, of the overhead type for trucks, and the other of the underneath type for pleasure cars.

The straight type chosen by the Timken interests has a small length of bearing, and therefore may be given more latitude in angle, and, as it fits the wheel on a tangent, it may be rocked on its bearings with little harmful result. If the bearings are out of alignment with the driving line, the only result is to raise the worm slightly from the wheel.

Fig. 1 shows the type of worm and wheel that is favored by the Timken company, and Fig. 3 shows two of its applications. That at the top is for pleasure cars, the underneath worm position insuring ample lubrication and permitting low suspension. The lower axle is the type used on commercial trucks, and permits a straight-line drive from the essentially high engine position on most trucks. This also gives higher clearance, although with the underneath construction, the low suspension permitted allows the use of sufficiently large wheels to raise the clearance to the required 10 inches for American roads. The Timken company will continue the manufacture of bevel-gear axles as long as there is a market for them.

Stevens Auto Cleaner

Gasoline vapor is recognized as superior to liquid gasoline, as a cleaning agent, both from the standpoint of effectiveness and economy. The Stevens Auto Cleaner, Stevens Mfg. and Supply Co., Chicago, is designed for the purpose of projecting gasoline in the form of a spray or a stream, at the will of the operator. It consists of a bullet-shaped tank, holding 1 quart, in the end of which is a nozzle, and at the back of which is a compound pump, valve control and handle. Gasoline is poured into the tank through a filler-plug, pressure is pumped up with the pump, and the vapor is ejected from the nozzle upon pressure being applied on a small button in the operator's hand. Light pressure produces a spray, while full pressure causes a powerful stream to play on the parts being cleaned.

New-Miller Carbureter

Preparation for a large production of Miller carbureters is being made by the New-Miller Carbureter Co., Indianapolis. The New-Miller carbureter embodies several new features in its construction. Chief of these are an annular air intake, concentric needle, and inter-connected air and gasoline control with the throttle. A dash adjustment is provided by which the nozzle may be adjusted as to opening. Referring to Fig. 2, a sectional view is shown. The gasoline is admitted to the float chamber by the usual needle valve. The float chamber is glass-walled and surrounds the venturi tube. The float is of copper, and its action is adjustable to a certain height of gasoline level, which level is plainly marked on the glass wall. The float is arranged to float clear of the wishbone throttle lever as long as the engine is running, but as soon as the engine stops the float locks the gasoline supply.

The nozzle is of the needle-valve type, the needle extending up to a position adjacent to the throttle-valve stem, to which it is

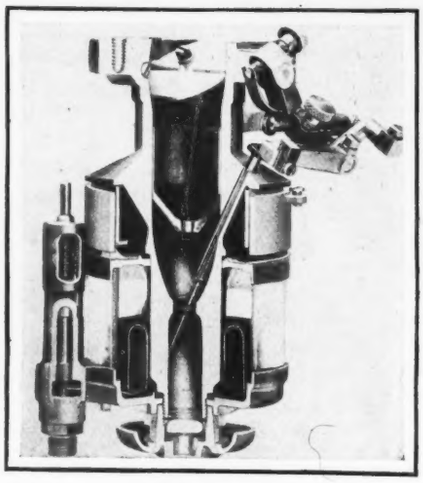


FIG. 2—NEW-MILLER CARBURETER

joined by an ingenious system of levers, which vary the opening of the needle valve in proportion to the throttle opening, at the same time permitting the needle opening at any one time to be varied. This is connected with the dash or steering-column adjustment and has no effect on the throttle opening. Within the mixing chamber is a piston, interconnected with the butterfly throttle valve. This piston controls the auxiliary air, which is taken in through an annular air intake. The piston is so connected to the throttle that the air is admitted to the mixing chamber in proportion to the degree of throttle opening. The annular form of the air intake insures an even distribution of air in the prime mixture.

Adjustment is provided to vary the proportional needle opening at the different throttle openings.

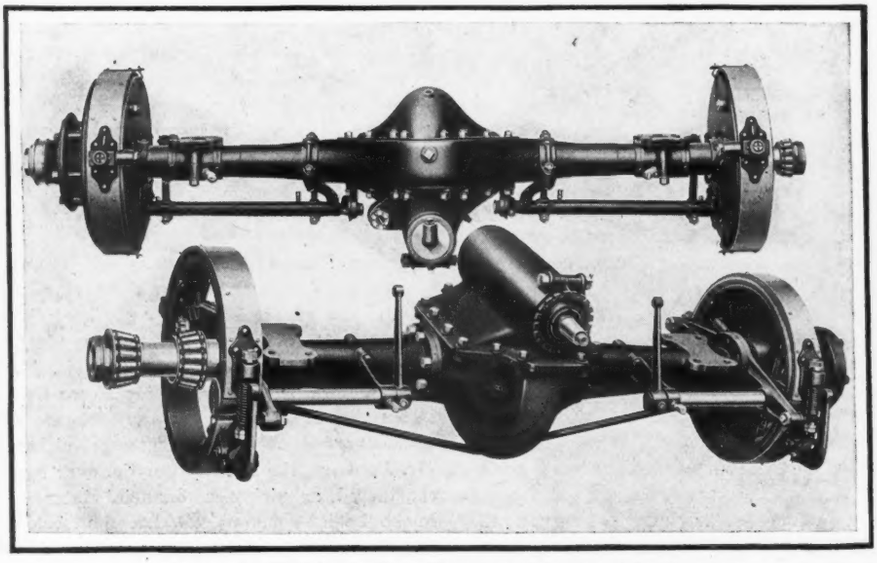


FIG. 3—TWO TYPES OF TIMKEN WORM-DRIVE AXLES

The Motorist's Kindergarten

EDITOR'S NOTE—Motor Age is publishing in this department a series of non-technical explanations of the various parts of motor cars for the benefit of the reader who knows nothing about them. The subjects will be dealt with in the most elementary manner, so that the series when completed will form a simple elucidation of the car.. The first article appeared October 10, 1912.

WE do not know just exactly what electricity is, but we have a very broad knowledge as to its properties, and these in many respects resemble water. Water is said to flow, and we speak of electricity flowing. Then, too, water is spoken of as being under a certain pressure and similarly electricity is said to be under pressure. Let us first consider the water. In the upper illustration of Fig. 23 a tank containing 1,000 gallons of water is on the top of a hill. At the bottom of the tank there is a pipe and some distance down the pipe there is a valve or faucet. The valve is used to control the flow of water. When the valve is turned on the water rushes down the pipe and hits against the blades of a paddle wheel. The wheel has a chain attached that turns a corn grinder G, shown in the lower illustration.

	HYDRAULIC	ELECTRIC
Capacity of source	Gallons	Quantity of electricity
Pressure	Head in feet Pounds per sq. in.	Volts
Resistance	Friction in pounds	Ohms
Current or Rate of flow	Gal. per min.	Amperes
Power	Horsepower	Volts X Amperes Watts Kilowatts
Energy	Horsepower-hours	Watt-hours Killowatt-hours.

The upper illustration shows a battery supplying electricity for an electric light. There is a switch in the circuit which corresponds to the valve in the upper picture. The switch is used to control the flow of electricity just as the valve is used to control the flow of water. If the switch is open the electricity will not flow through the electric lamp, but if the switch is closed the electricity can flow.

The 1,000 gallons of water in the tank cannot flow out all at once. If the valve is opened a little it will permit a small quantity of water to flow, and the more it is opened the more water will flow, just as water flows from the faucet in our homes when the valve is turned. When the switch in the upper picture is closed it allows the electricity to flow through it into the electric lamp. Just as the water cannot flow out of the tank all at once so the electricity in the battery cannot flow out all at once, but a little at a time. The rate at which the electricity flows out of the battery corresponds to the rate at which the water flows out of

Amperes and Volts

the water tank. The water may flow at the rate of 50 gallons per minute. But we cannot measure electricity in gallons per minute. We speak of the rate at which the electricity flows out of the battery, and this is known as the current. The current of electricity then is the rate of flow of units of electricity, and the current is measured in amperes. When we speak of a current of 10 amperes it means that a certain amount of electricity is flowing through the wire at a certain rate. The 50 gallons of water flowing out of the pipe every minute correspond to the current of electricity. The current of a river should be brought to mind. The river is said to have a swift current, which means that the water flows by rapidly. Similarly, the electric current flows in the wire, and the faster it flows the stronger the current.

Water is spoken of as being under pressure, 50 pounds per square inch, or whatever the case may be. If we were to pump air into the tank shown in the illustration the water would flow faster, for the air would be pushing it ahead all the time. Then it is seen that the greater the pressure the faster the flow of water. A current of electricity also is said to be under pressure. The current that leaves the battery is under a certain pressure. But instead of saying that the current of electricity is under so many pounds per square inch pressure we use another term —voltage. The volt is the unit of electrical pressure. The expression 50 pounds pressure is used, the parallel expression being 50 volts pressure. That is, the current is under a pressure of a certain number of volts.

In the illustration below, if the pipe were made larger in diameter the water would flow much more freely through the pipe and the rate be greater. The smaller the diameter of the pipe the harder it is for the water to get through. The same thing holds true of an electric current. The greater the diameter of the wire the easier the electricity will flow and the greater the current in amperes. The smaller the diameter of the wire the harder it is for the electricity to pass and the less the current will be. In other words, the wire through which the current flows offers resistance just as the pipe does in the case of the water. Then the water hits against the paddle wheel, and the paddle wheel hinders the flow of the water to some extent. The electricity must flow through the thin wire of the electric lamp. It is with difficulty that the current gets through the wire. So it is said that the wire offers resistance, just as the pipe and paddle wheel make it hard for the water to flow.

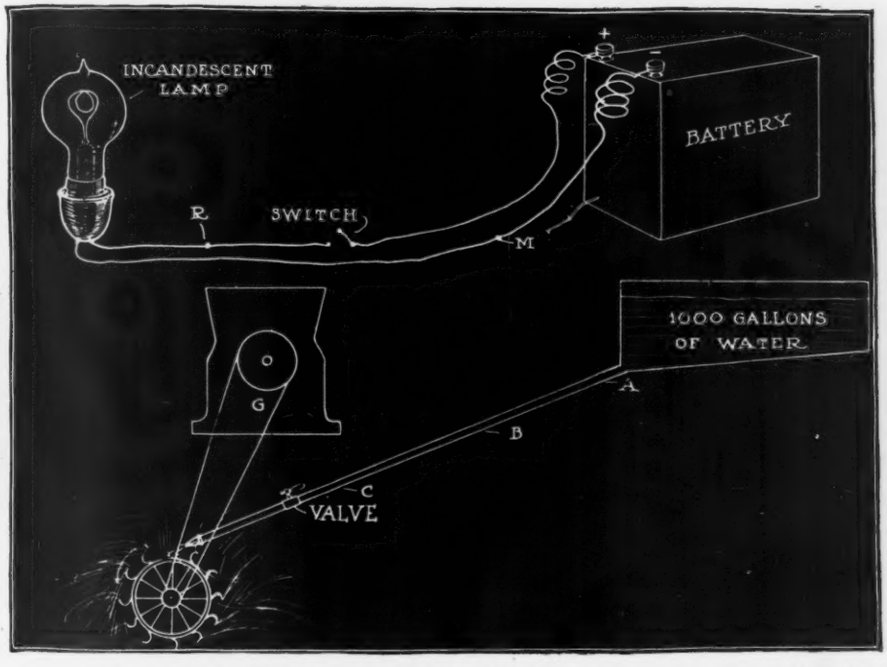


FIG. 23—ILLUSTRATING THE HYDRAULIC ANALOGY OF ELECTRICITY

Brief Business Announcements

YOUNGSTOWN, O.—The Auto Rubber and Cycle Co. has filed papers changing its name to the Auto Rubber and Mill Supply Co.

Joliet, Ill.—The Central Trust Co., of Chicago, has been appointed receiver for the defunct Joliet Motor Car Co. The liabiliities are $15,000; assets $8,000.

Philadelphia, Pa.—The Chase Motor Truck Co., Syracuse, N. Y., has established a factory branch in this city at 3607 Lancaster avenue, with E. F. Howell as branch manager.

St. Louis, Mo.—A factory branch house of the Motz Tire and Rubber Co., Akron, O., was opened in St. Louis last week. It is located at 4378 Olive street. E. G. Deibel, recently with the Goodrich local house, is in charge.

Syracuse, N. Y.—William R. Marshall, secretary of the Syracuse Automobile Dealers' Association and manager of the Syracuse show for 3 years, will leave immediately for Calgary, Canada, to engage in the concrete construction business.

Boston, Mass.—In future all the Studebaker products handled at retail in Boston will be through the Donovan Motor Car Co., the company having decided to discontinue Boston as a retail branch. The wholesale department will be continued under Manager Philip Hawley.

Boston, Mass.—The Boston branch of the Ford Motor Co. has just purchased a big block of land between 6 and 7 acres just across the river in Cambridge upon which it will erect a service station to take the place of the one it now uses in Cambridge in connection with the Boston branch station.

San Francisco, Cal.—Henry D. McCoy has been appointed general manager of the Chanslor & Lyon Co., one of the largest exclusive supply houses in the United States. All the branches in San Francisco, Los Angeles, Fresno, Portland, Seattle and Spokane have been consolidated into one corporation. McCoy has been treasurer of the firm for several years.

Louisville, Ky.—The Studebaker Corporation has discontinued its Louisville branch. No wholesale business will be transacted hereafter and the retail end of the Studebaker concern will be handled by the Rommel Motor Car Co. W. W. Beeson, who has been manager of the branch, has been transferred to Denver. According to the new plan of the Studebaker Corporation, the Kentucky wholesale business will be handled through the Indianapolis branch. The Tennessee business, heretofore handled through the Louisville branch, will be handled through the Birmingham branch. The Rommel concern will occupy the Studebaker branch building after January 15, with N. W. Bywater in charge of the Studebaker sales.

Boston, Mass.—The Boston branch of the Essenkay Co. has been closed up and the company has retired from the Boston field as a branch proposition.

New York—The Colt-Stratton Co., eastern distributor for the Cole, has moved to larger sales quarters on Broadway at Fifty-eighth street; increased the space of its service department; moved its wholesale offices to the service department building on West End avenue at Sixty-third street and generally increased its executive and sales forces.

Columbus, O.—The Ford company has opened a factory branch to cover forty counties in central Ohio, which is located at 267 North Fourth street, Columbus. P. F. Minoch is manager of the branch.

Philadelphia, Pa.—Another acquisition was made to the rapidly growing row on Market street during the past week when the Pullman Automobile Co. removed from 662 North Broad street to 1927-1929 Market street.

Milwaukee, Wis.—H. L. Scharlach has been appointed manager of sales for the Sternberg Mfg. Co., maker of commercial vehicles. Mr. Scharlach has been connected with the F. A. Ames Co., Owensboro, Ky., for the past 9 years.

Montreal—The Royal Automobile Co. in the future will be known as the Royal Automobile Garage Co., Ltd., with a $50,000 capital. The company will maintain salesrooms at its present location, St. Denis and Ontario streets, for the distribution of Cole, Stevens-Duryea and Apperson.

Columbus, O.—Samuel A. Schwartz, formerly Ohio manager of the A. G. Harbaugh Co., has joined forces with Edward McKelvey and H. Walling in organizing the S. A. Schwartz Oil Co., with headquarters in Columbus. The new company, which is located at 183, 185, 187 West Maple street, will handle oils and greases.

Anderson, Ind.—Harry J. Galvin, for several years chief accountant and later auditor of the Remy Electric Co., has resigned to become president and general manager of the Galvin Specialty Co., a new company organized in Anderson, which will manufacture and market gas machines for heating garment-pressing and laundry machinery.

Columbus, O.—F. E. McClure has been made manager of the United Motor Columbus Co., of Columbus, O., central Ohio distributor for the United Motor line, in the place of Frank Corbett. Mr. McClure was formerly in charge of the Cleveland branch, which has been abandoned, and all of the shopping for that territory will be done from the Columbus branch.

Philadelphia, Pa.—The Cole Motor Co., Inc., has been organized in Philadelphia to distribute the Cole motor car. The Cole has operated in Philadelphia under the name of Henry A. Rowan, Jr., Automobile Co., located at 612 North Broad street. The new organization has moved to larger sales quarters at 332 North Broad street. The same men who were in the old organization continue with the new.

Recent Incorporations

Anna, Ill.—Anna Motor Car Co., capital stock, $2,500; incorporators, J. H. Corzine, R. Rinehart, E. Lawson.

Buffalo, N. Y.—United States Rubber Reclaiming Co., capital stock, $2,400,000; to manufacture and deal in rubber goods; incorporators, T. W. Bassett, R. A. Loewenthal, C. Beebe.

Chicago—Adix Automobile Co., capital stock, $2,500; incorporators, G. H. Rees, P. L. Adix, J. Rothschild.

Cincinnati, O.—Hermes Motor Co., capital stock, $30,000; incorporators, A. Kleybolte, P. Crosley, Jr., C. Eissen.

Cleveland, O.—Praco Mfg. Co., capital stock, $15,000; to manufacture lamps and specialties; incorporators, H. G. Smith, J. C. Hipp, T. J. Smith, T. Laness, D. Pfahl.

Detroit—Oostdyk Gear Shifter Co., capital stock, $50,000; incorporators, F. E. Holmes, W. W. Campbell, J. B. Wheelan.

Dover, Del.—Standard Motor Co., capital stock, $31,000,000; general motor car business; incorporators, D. Muehleman, H. E. Latter, W. J. Maloney.

Louisville, Ky.—Speedway Tire Co., capital stock, $250,000.

Milwaukee, Wis.—William H. Wegner Co., capital stock, $5,000; to deal in accessories; incorporators, W. C. Wegner, W. H. Wegner, L. H. Kurz.

New York—F. W. Ofeldt & Sons, capital stock, $20,000; to manufacture motor trucks.

New York—Drouet & Page Co., capital stock, $10,000; to manufacture motors; incorporators, C. Milliken, I. E. Larsen, M. B. Hofman.

New York—E. J. Sullivan Corp., capital stock, $5,000; motor car business; incorporators, R. C. Ballantine, E. J. Sullivan, W. F. Hopper.

New York—New York Motor Speedway Association, capital stock, $1,000,000; to promote speedway races; incorporators, W. B. Allen, H. J. Carter, A. B. Casner.

Newark, N. J.—Universal Motor Truck Co., capital stock, $50,000; to deal in motor trucks; incorporators, John Kramer, G. Cleveland, P. Mauan.

Port Clinton, O.—Holmes Tractor Co., capital stock, $50,000; to manufacture farm tractors; incorporators, G. H. Holmes, G. W. Sloan, R. S. Galleher, A. R. Luschinger, F. S. Dennernberg.

Portland, Me.—Apperson Automobile Co., $10,000; incorporators, E. H. Wilson, A. L. Edgecomb, E. H. Wilson.

Quincy, Ill.—Machinery & Motor Co., capital stock, $25,000; incorporators, B. Kinsey, F. H. Wilms, H. V. C. Tingley.

Rochester, N. Y.—Ball-Washburne Motor Co., capital stock, $25,000; incorporators, W. Ball, C. H. Washburne, A. R. Ball.

Springfield, Ill.—Associated Auto & Supply Co., capital stock, $2,500; incorporators, J. M. White, J. W. Carlisle, R. J. Hunter, V. S. Welch, G. D. McCarty.

St. Louis, Mo.—T. J. Moss Motor Car Co., capital stock, $10,000; incorporators, T. J. Moss, J. W. Fristoe, E. J. Dykstra.

Toledo, O.—Rubber Nix Mfg. Co., capital stock, $10,000; E. A. McLean, president.

West Seneca, N. Y.—George Schuster Garage & Sales Co., capital stock, $5,000; incorporators, J. F. Berner, Sr., Reinhold C. Berner, George Schuster.

Six Passenger "32"

$1175 F. O. B. Detroit, has equipment of two folding and revolving occasional seats in tonneau, foot rest, windshield, mohair top with envelope, Jiffy curtains, quick detachable rims, rear shock absorber, gas headlights, Prest-o-lite tank, oil lamps, tools and horn. Four cylinders 3¼-inch bore and 5½-inch stroke; 126-inch wheelbase; 33 x 4-inch tires. Standard color, black. Trimmings, black and nickel.

Hupmobile

The "32" Coupe

A distinguished addition to a distinguished line

First View, New York Motor Show, Jan. 11—18

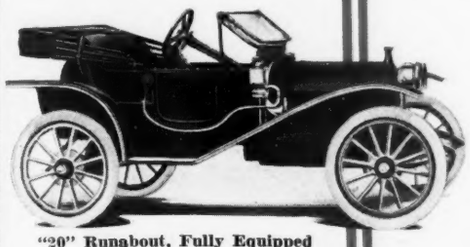
In exterior appearance, the Hupmobile Coupe is as unobtrusively unique and as well-balanced as the other models of the "32" type.

In interior finish and appointment, it is rich and luxurious—imported Bedford Cord upholstery, with side walls to match and ceiling done in heavy satin; with right-hand control and room for three adults in comfort.

The coupe rounds out the line of Hupmobile pleasure cars, which now includes two touring models and a roadster, all built on the same sturdy "32" chassis, and the well-known "20" Runabout.

The entire line will be displayed at the New York and Chicago shows.

Inspect the cars there, at any other shows or at the dealer's; and you will see why we believe the Hupmobile to be, in its class, the best car in the world.



"20" Runabout, Fully Equipped

750 F. O. B. Detroit. Four cylinders, 20 H. P., sliding gears, Bosch magneto, top, windshield, gas lamps and generator, oil lamps, tools and horn.

"32" Touring Car or Roadster, shown at right of six-passenger "32", fully equipped, $975 F. O. B. Detroit.

Three Passenger "32" Coupe

$1350 F. O. B. Detroit, including equipment of electric lights and 100 ampere battery, electric horn, speedometer with clock, extra wide seat for three passengers, 54 x 22 inches; quick detachable rims, 33 x 4-inch tires, rear shock absorber. 106-inch wheelbase. Standard color, black. Trimmings, black and nickel.

Hupp Motor Car Company
1228 Milwaukee Ave. Detroit, Mich.

Every automobile dealer should read OUR proposition

Stock Champion ***International Champion***

National

Luxury & Utility Combined

Five Models, Improved Series V, $2,750 to $3,400.. Following are a few of the pleasing features of National cars:

Long-stroke (4⅞ x 6) flexible and noiseless Motor with enclosed valves.
Left-Side Drive.
Center Control.
Gray & Davis Electric Starter.
Truffault-Hartford shock absorbers on rear.
Gray & Davis Dynamo Electric Lighting System.
Bosch dual double Magneto.
12-inch Turkish Upholstery.
Full heavy nickel Trimmings.
Electric Horn.
Adequate Baggage-carrying Compartment concealed in body but easily accessible.
Powerful and reliable Brakes.
Spacious Interior.
Tire Pump, integral part of the motor. Inflates a tire in three minutes.
128-inch Wheelbase.
Adjustable, ventilating and rain vision Windshield.
Multiple jet Carburetor.
Hoffecker steady-hand Speedometer.
Tire Carrier in rear.
Silk mohair Top, Cover and Curtains.
Full-floating Rear Axle.
Resilient Springs, ¾-Elliptic in rear; Semi-Elliptic in front.
Large gasoline pressure-feed Tank with Gauge in rear.
Robe Rail and Foot Rest.
Foot Mat in Running Board.
Plain, continuous enclosed Metal Guards.
Easy-riding qualities unexcelled.
Oiling System, demonstrated to be only perfect oiling system.
One extra Firestone demountable Rim.

Consider the Factory Service That

One extra Firestone demountable Rim.

National

Consider the Factory Service That Goes With This Car—

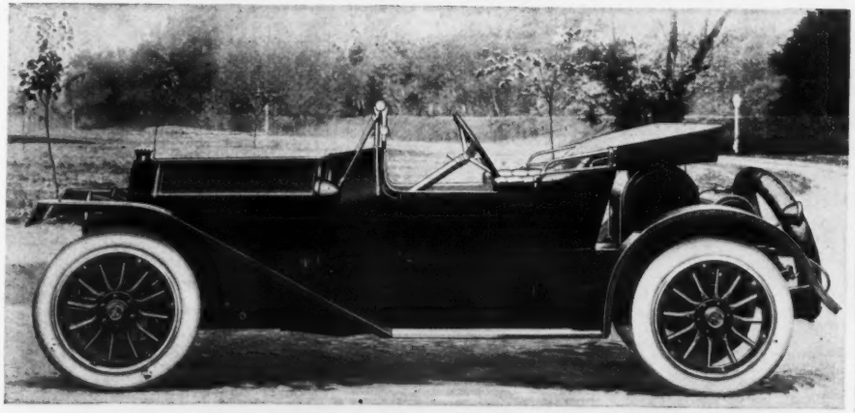
The MEN Behind This Car Give YOU Personal Attention and Co-operation

You get *more* than a good, money-making car when you are a National dealer. You get the prompt, *personal* attention and aid of the men at the National factories behind your car. Twelve years of manufacturing experience guarantees your car—and the men behind the car guarantee your factory service and selling assistance.

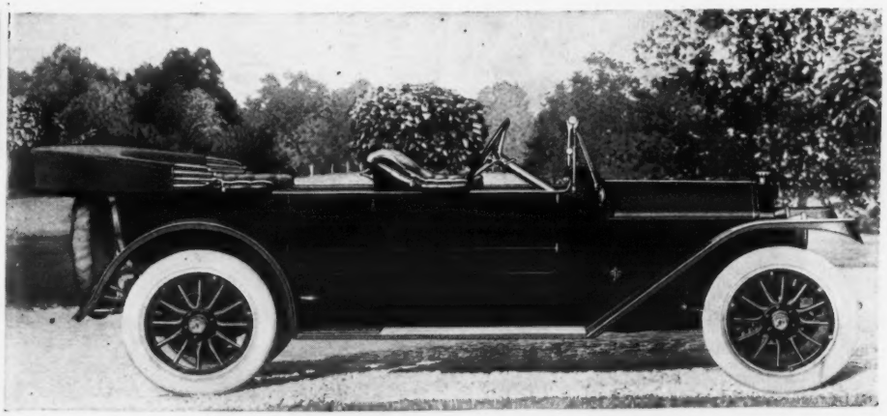
Every dealer appreciates the advantages of quick, reliable factory support. You become a member of the National "family"—and we all work together. This is your bonus, as it were, that goes with every car free—a service and co-operation that means much to you.

See It At the Shows

Your past experience and your good judgment as to what the people demand in a modern motor car leads you direct to the National with its electric self starter and lighting system, roomy, comfortable body, left side drive and center control. Come and see the new National cars at the Automobile Show, or write us at once for catalog and dealers' proposition.



Speedway Roadster, Improved Series V



Five-Passenger Touring Car, Improved Series V

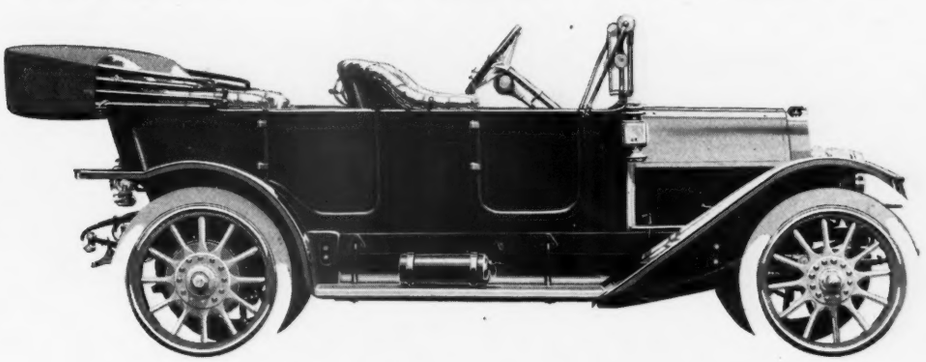
National Motor Vehicle Co., Indianapolis, Indiana

Overland

$985—Completely Equipped

Model 69-T

Self-starter
30 Horsepower
5-Passenger Touring Car
110-inch Wheel Base
Timken Bearings
Center Control
Remy Magneto
Warner Speedometer
Mohair Top and Boot
Clear Vision, Rain Vision
Wind Shield
Prest-O-Lite Tank



$1475—Completely Equipped

Model 71-T

Complete Electric Lighting Outfit, Generator and Storage Battery
Self Starter
45 Horsepower
Q. D. Demountable Rims
Timken Bearings
Center Control
Wheel Base 114 inches
Brewster Green Body, ivory striped, nickel plated and dead black trimming
Warner Speedometer
Mohair Top and Boot
Clear Vision, Rain Vision
Wind Shield
Prest-O-Lite Tank
Extra Rim

Touring Cars, Roadsters, Coupes and Torpedo Bodies

Jackson "Sultanic"—$2650

Seven-passenger. Six-cylinders, 55 horsepower; unit power plant; long stroke motor, 4⅛x4¾ inches; 138-inch wheelbase; 36x4½-inch tires. Full elliptic springs, front and rear. Deep roomy body, with 10-inch upholstery. Gasoline tank under dash supplied from storage tank at rear with pressure pump. Total capacity twenty gallons. Electric starter, electric dynamo and lighting system, mohair top, top hood, ventilating windshield, speedometer, oil and gasoline gauges on dash, demountable wheels, extra wheel, wheel carrier, robe rail, foot rest, pump, jack, tire outfit and tools. Trimmings black and nickel. Five-passenger, $2500.

Jackson dealers are enthusiastic; that's the story of the new Jacksons

When the first of the new Jacksons was announced, a wave of enthusiasm swept the country. Inquiries literally poured in.

That's how the buying public received the Jackson; and the same result followed the announcement of the other models.

What did the dealers do?

To a man they saw the great possibilities presented by the Jackson line.

Every one of them came in with requests—no, they were demands—for increased allotments.

"Sell?" they said, "you are giving us the best selling line of Jacksons you ever built!"

That's what they said when they were told about the cars.

Their enthusiasm was increased a hundred-fold when we outlined the most extensive advertising campaign the Jackson Company has ever attempted.

This advertising includes not only double pages and single pages in publications like the Saturday Evening Post, Collier's, Literary Digest, Life, etc., etc., but local newspaper advertising continuous and consistent through the big selling seasons.

Is it any wonder that Jackson dealers are on tiptoe?

They have a line of cars they can sell in competition with anything on the market—on any basis whatever.

They are sure of themselves; sure of their cars; sure of factory co-operation through a big advertising campaign.

Jackson "Majestic"—$1975

45 horsepower, unit power plant; four cylinder, long stroke motor, 4½x5¼ inches; 124-inch wheelbase; 36x4-inch tires. Full elliptic springs, front and rear. Deep, roomy body, with 10-inch upholstery. Electric starting and lighting system, dynamo and storage battery. Equipment of mohair top, top hood, ventilating windshield, speedometer, oil and gasoline gauges on dash, Firestone universal quick detachable rims, extra rim, tire carrier, electric horn, robe rail, foot rest, pump, tire outfit and tools. Black and nickel trimmings.

Their feet are on solid ground; they are in position to put ginger into their work and they are doing it.

If your instinct for business tells you that you want to be with the Jackson, say so to us and without delay.

The sooner you act, the better your chance if your territory is now without Jackson representation.

Jackson "Olympic"—$1500

35 horsepower, unit power plant; four cylinder, long stroke motor, 4⅛x4¾ inches. 115-inch wheelbase; 34x4 inch tires. Full elliptic springs, front and rear. Deep roomy body, with 10-inch upholstery. Gasoline tank under dash, supplied from storage tank at the rear, with pressure pump. Total capacity twenty gallons. Equipment includes Disco self-starter, mohair top, top hood, ventilating windshield, speedometer, oil and gasoline gauges on dash, Prest-O-Lite tank with automatic electric lighter; Firestone universal quick-detachable demountable rims, extra rim, tire carrier, robe rail, foot rest, pump, jack, tire outfit and tools. Trimmings, black and nickel.

Jackson Automobile Company, 1207 East Main St., Jackson, Mich.

New York Show—Jan. 11-18—Madison Square Garden, Space 111, Elevated Platform
Chicago Show—Feb. 1-8—First Regiment Armory, Space B-2, immediately to right of Michigan Ave. entrance

$2750 The New Garford Six *$2750*

THIS NEW SIX differs from the average Six in that it is brand new in every respect. No part, piece or pattern has ever been used in any other Six. No old designs have been re-designed in an effort to bring them up to date. It is a new Six throughout.

Every single part, such as the motor, the electrical equipment, the axles, the transmission, the frame, the speedometer — which is driven from the transmission, the big, single electric parabolic headlight, sunk flush with the radiator and the one-piece all-steel body is new. In fact the entire car is a brand new development in design, treatment, style and finish.

The new Garford six is a five passenger touring car. It is electrically started; all lights are electric, the horn is electric, it has a sixty horsepower, long-stroke motor — the measurements of which are 3¾″ x 6″, the wheel-base measures 128 inches, the tires are 36″ x 4½″, it has demountable rims, it has the very practical and popular left-hand drive and center control. It is, of course, completely equipped with the very best and very finest accessories. The price, complete, is $2750.

We are distributing the New Garford Sixes throughout the country as rapidly as possible. See the Garford Six at your local dealer's or at the big national automobile shows that are now being held throughout America.

Write us for descriptive and illustrative literature.

The Garford Company, Elyria, Ohio

For Dealers Only

THE new Garford Six (illustrated and described on the opposite page) offers you the most practical and profitable high grade motor car proposition you can possibly obtain.

This car is the most highly developed Six in the country—based on the very latest European and American six-cylinder practice.

This car is the lowest priced high grade Six made.

This car has more exclusive, more new and more practical features than any other car of its type on the market.

This car has behind it one of the foremost, largest, and complete organizations in the business.

The Garford Company
Elyria, Ohio

This car will be extensively advertised all over America. Over $200,000 is set aside for the 1913 advertising campaign.

Some territory is still open.

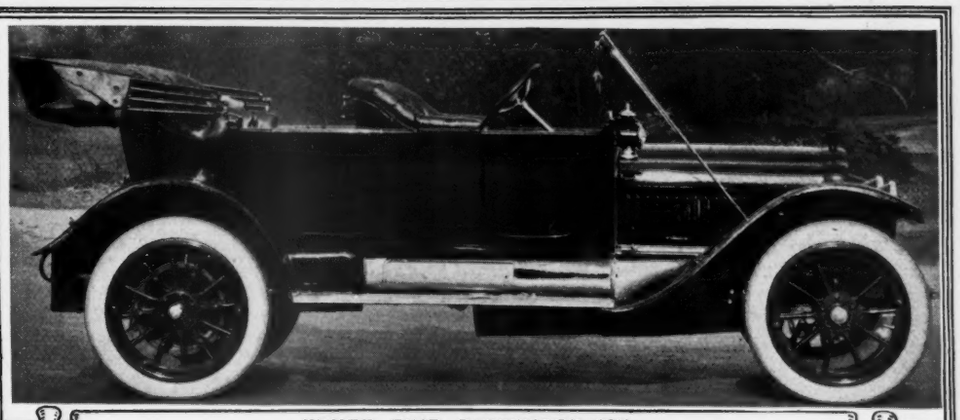
Fill out coupon and mail today.

The Garford Company, Elyria, Ohio.
Dept. 14

Please send me complete information about the new Garford Six.

Name .....

Address .....



WHITE FIVE PASSENGER SIX
Electrically Self-Started and Lighted

THE WHITE SIX

Electrically Started and Lighted—Left Side Drive

The purchaser of a high-priced car has the right to expect superior design and equipment as well as superior material and workmanship.

The White was the first Six to introduce left-side drive, and today presents this logical method of control in its most desirable form—with right-hand operation of the gear-lever.

The White was the first Six to incorporate in its equipment an electrical starting and lighting system. The White Electrical System is designed and built by The White Company, in The White Factory, especially for White Cars. The White is the only Six today equipped with an electrical system that is manufactured by an automobile company especially for its own product.

Gasoline Motor Cars, Trucks and Taxicabs

The White Company
Cleveland

Robbing Peter to Pay Paul

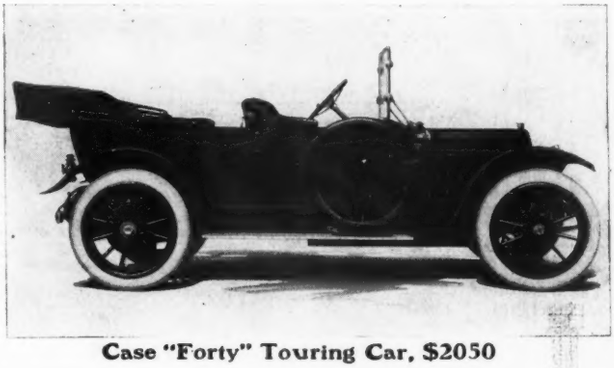
WHAT determines the worth of your car, you men and women who want to invest wisely? Is it the appearance of the car? Is it the accessory equipment? Is it a detail such as upholstering? Yes, to some extent. These qualities we agree are very essential to the wholly satisfactory car, but we believe that they are only a small item in its final value. Genuine value in a car cannot be seen; it does not show in the specifications. It comes in the careful designing, and the honest manufacture of the vital parts of the machine. These parts do not show on the surface, but in the long run the honesty of these parts measures the real merit.

CASE CARS combine to an unusual degree all the essentials of the "complete car." In these cars absolutely nothing has been overlooked or "skimmed." We have been painstakingly careful in the parts that do not show—in the parts that do the work. To the equipment and conveniences we have given minute attention.

Examine CASE cars at the New York, Chicago, Boston, Philadelphia, or any of the winter shows; examine them on the road—anywhere, everywhere — and you will find nothing shallow, nothing superficial. ***No unseen part has been robbed to pay for some surface adornment.*** Through and through—inside and out—the CASE cars are real—they are genuine. They are built to continue the seventy-year reputation of the CASE COMPANY as manufacturers of wholly reliable machinery. There is no car on the market at the price — and few at higher—that has in it the "real stuff" that is in the CASE car.

How can we do it? Remember that the Case Company has been manufacturing machinery for over seventy years; that it has sixty-five big branch houses, and over six hundred traveling representatives, co-operating with the ten thousand CASE dealers in the United States, Canada, South America and Europe. Our producing and distributing expenses for automobiles are but a part of the tremendous organization, and therefore are far below those of the manufacturers of automobiles alone.

Is this not a sound business proposition? Our 1913 Catalog describes in detail the genuine, the complete, the permanent car. We shall gladly answer all inquiries from you who would invest wisely.



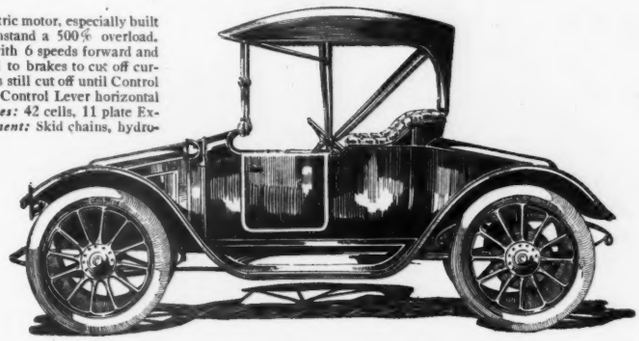
Case "Forty" Touring Car, $2050

Case "Thirty" Touring Car, $1500

J. I. Case T. M. Company, Incorporated

705-755 Liberty Street **Racine, Wisconsin, U. S. A.**

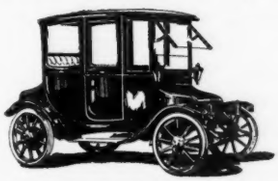
Specifications: General Electric motor, especially built for us to withstand a 500% overload. General Electric non-arcing controller with 6 speeds forward and 3 reverse. Interlocking device attached to brakes to cut off current when brakes are applied. Current is still cut off until Control Lever is returned to neutral position. Control Lever horizontal type. Wheel base, 96 inches. ***Batteries:*** 42 cells, 11 plate Exide. ***Speed:*** 35 miles per hour. ***Equipment:*** Skid chains, hydrometer, odometer, pneumatic tires, 34x4.



The Borland 1913 Roadster—It will be a great *Business* and Professional Man's car $2550

The *Borland* Electric Pre-Eminent *for* Business and Pleasure

Today, now—practically every convenience and comfort and luxury is accomplished by electricity. Electricity is easily controlled, clean, powerful and reliable.

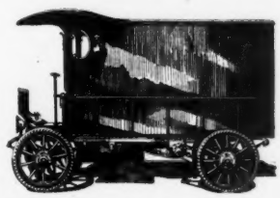


Borland 1913 Colonial Coupe, $2700

The Borland Electric is the foremost example of electrical efficiency, engineering science and artistic effort. You want an electric that is built on spacious lines—the Borland models answer your demands; they accommodate from three to seven people with absolute comfort.

You want a luxurious car. The Borland models will appeal to you as being the most artistic and attractive.

But do not decide on merely the seating arrangement and beauty of design, as construction which insures your enjoying these features is vastly more important.



Borland Truck—closed body $2250

The Borland Electric Pre-Eminent Construction

Since the first Borland was made we have concentrated on the designing, building and perfecting of one chassis. We are finally satisfied that the Borland chassis represents the best engineering ideas and the correct selection of metals for each and every part. The proof of the efficiency of this chassis is our long list of satisfied customers.

Borland 1913 Outside Drive Limousine—the Electric De Luxe, $5500

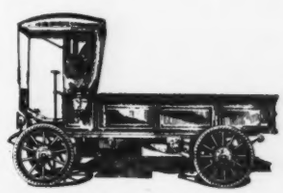
Now that every engineering and service test has proved that every detail of Borland construction is right, we are putting out seven new models, built on the same mechanical principles which made the Borland Brougham so satisfactory and successful.

The 1913 models are equipped with the new Borland simplicity horizontal control, the greatest improvement for controlling speed. The motor is hung in the center of the chassis on 3-point suspension, and the bodies are designed on spacious lines to seat from three to seven people comfortably, and to give the clearest view of the road. Front or rear drive, optional.

These and many other points are explained fully and frankly in the new Borland Poster Booklet and Catalog, both of which will be sent upon request.

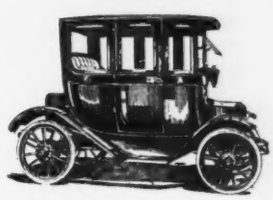
During the New York Show Mr. U. B. Grannis, Vice President, will be at the Waldorf Hotel. Mr. Grannis will be pleased to talk with dealers who desire information regarding the Borland.

Our complete line of models will be demonstrated at Chicago Show, Space A1, 1st Regt. Armory



Borland Truck—open body, $2100

Borland 1913 Regular Coupe—$2900



The Borland Brougham $2500

The Borland-Grannis Co.

Salesrooms: 2634 Michigan Ave. Chicago Factory: E. Huron St.

Dealers: Start the new year *Right*. Do a twelve-month business without increasing your overhead, selling Borland Electrics. We are closing with many well-established dealers—write today for particulars.

Four-cylinder and six-cylinder cars.

STUTZ

The car that made good in a day

You Should Know More About the Stutz

WHETHER you are a prospective owner or dealer you should go into the vital parts of the STUTZ car and get the facts—be convinced.

The STUTZ is made right from the radiator to the rear axle. The real worth of a car comes in the construction.

Every mechanical principle of the STUTZ is positively correct. It is made from experience. There are no fads, no uncertainties, in the STUTZ—just **sturdy** mechanical common sense.

Every ounce of material—every detail of workmanship that goes into every STUTZ car is absolutely the best. That is one of the **reasons why** the upkeep cost of the STUTZ is the lowest.

Every STUTZ has a powerful motor that will pick up on any road or hill at the touch of the throttle.

The STURDY STUTZ HAS MADE GOOD in contests on road and track. It has **made good** on every road it ever traveled. It has attained a record second to none for consistent performance.

The straight line low slung body, deep upholstery and luxurious appointments of the STUTZ give it that aristocratic design that lends dignity and quality to a high class motor car.

The STUTZ is exceedingly easy riding and comfortable. Your STUTZ will not take up valuable time by mechanical delays. The STUTZ is always ready for service—in all sorts of weather—over all sorts of roads.

The STUTZ dealer knows from experience that the STUTZ gives perfect satisfaction—makes friends of his customers and does not eat up his legitimate profits in mechanical adjustments.

There are cars selling at a price far above the STUTZ—but there is only **one car** with the real STUTZ QUALITY.

STUTZ MODELS

STUTZ cars are made in five models.

Six-cylinder, six-passenger touring car -	$2,300
Six-cylinder roadster - - - - - - - - -	2,250
Four-cylinder, six-passenger touring car -	2,050
Four-cylinder, four-passenger touring car -	2,000
Four-cylinder roadster - - - - - - - -	2,000

STUTZ FEATURES

Full electric light equipment with dependable generator and storage battery.
Stutz special rear system.
Timken front axle.
Gemmer "A" grade steering gear.
Force feed oiling system through hollow crank shaft.
Over size tires.
Water-jacketed intake manifold.
Black and nickel trimmings throughout.
4¼x5 T-head motor in six-cylinder models.
4¾x5½ T-head motor in four-cylinder models.

STUTZ cars will be among the big features of the New York and Chicago Automobile Shows. Look them over. Go into the vital parts of the STUTZ and get the facts.

Whether a prospective STUTZ owner or a prospective STUTZ dealer, write today for the **STURDY STUTZ** Catalog B-2

THE IDEAL MOTOR CAR COMPANY

Indianapolis *MANUFACTURERS OF STUTZ CARS* **Indiana**

Stutz Six-Cylinder, Six-Passenger Touring Car $2300

Men Will Want

These Things This Year in a "40"

Mark all the features listed below this cut.

Note the four forward speeds, the over-wide tires, the center control, the left side drive.

Note the electric lights, the 14-inch cushions, the roomy, 22-coated body, the 50-inch rear seat.

Note the big springs, the big brakes, the immense over-capacity.

And note the price at which these things are given. Does any Forty you know make a comparable offer?

All Men Will Know

Our dominant advertising, all the time, keeps all these facts before motor car buyers.

They are bound to know—just as you know—that these things all belong to up-to-date cars.

And they'll know that no other car in this class makes an equal offer at the Michigan price.

It's a Cameron Car

This is not the product of an obscure engineer. It is built by W. H. Cameron, a man whose work is known the world over—who has built 100,000 successful cars.

The body is designed by John A. Campbell, whose body designs have been chosen by kings.

The concern back of the Michigan is one of the largest and strongest of its kind. And we waited four years to perfect this car before we came out in the limelight.

Scores of the ablest men have given their best to it. And 5,000 Michigans have been put on the road to test their 300 improvements.

The final result—the latest Michigan model—is one of the greatest cars of the day.

World-Wide Fame

The car has jumped, in the past four months, into almost world-wide fame.

Experts have come here from 11 foreign countries. They have selected the Michigan to compete in Europe with the finest foreign cars.

Hundreds of American dealers, who know the whole market, have chosen the Michigan as the greatest car in its class.

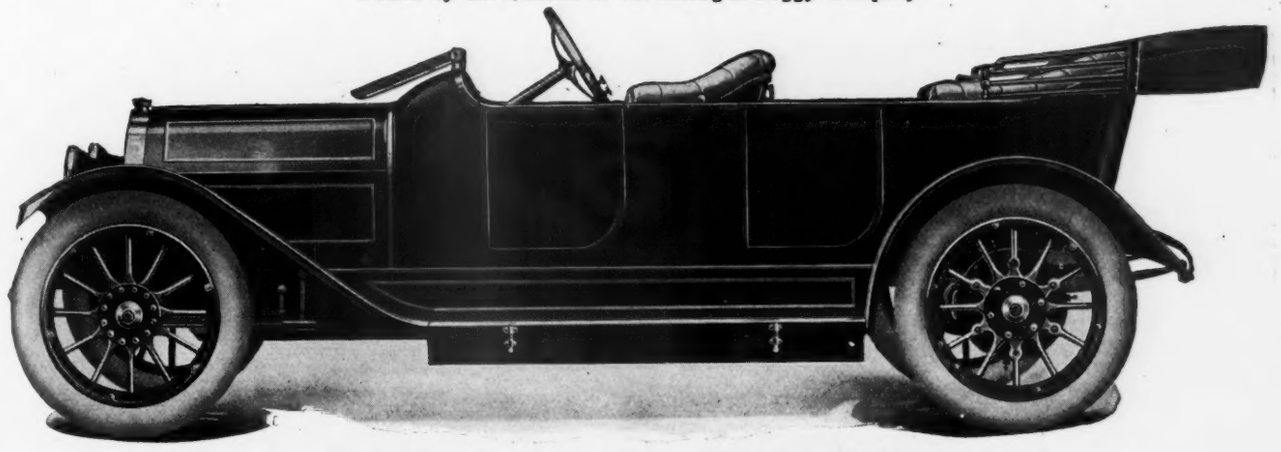
Such a verdict can't be avoided by any man who knows the facts.

We invite dealers and users to send for our catalog and the facts which they wish to know.

(189)

MICHIGAN MOTOR CAR COMPANY, Kalamazoo, Michigan

Owned by the Owners of the Michigan Buggy Company



SOME OF THE MICHIGAN FEATURES

Four-forward-speed transmission
Oversize tires—35x4½
Electric lights and dynamo
Center control—left-side drive
Motor, 4½x5¾
Extra effective brakes—16x2¾ ins.
Big, comfortable springs
Adjustable steering post
Adjustable pedals
Firestone Q. D. demountable rims—extra rim

14-inch Turkish cushions
Rear cushions 50 inches long
Hand-buffed leather upholstering
Best curled-hair filling
Wheel base, 118 inches
Nickel mountings
Large over-capacity, giving big factors of safety
Pressed steel, full-floating rear axle
Axles sufficient for an 80-horsepower car

Genuine cellular-type radiator
Best mohair top, side curtains and envelope
Windshield built in as part of body
Electric horn
$50 speedometer, 4-inch dial
Special foot rail
Swing robe rail
Rear tire irons
Complete tool equipment
Tool chests under running boards

There is such a difference of opinion about the various types of self-starters that we have not adopted any one type as regular equipment. We prefer to leave this selection to the buyer. We equip with either the gas or a positively efficient electric starter at moderate extra price.

KEETON
DETROIT, U.S.A.

A European Type— At An American Price!

Few people will deny that they consider foreign cars better in many ways than those made in this country.

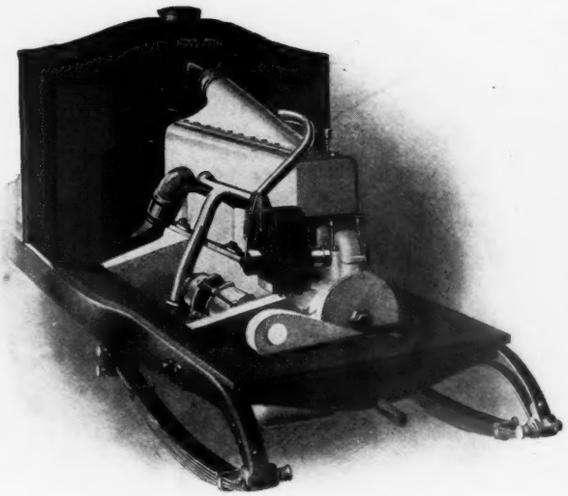
They are distinctive and more attractive in design, and have several features of construction which mean more efficient service. But the only fault found is in the price, which is very exorbitant to most buyers, because of the methods employed by the European builders and the high tariff.

Distinctive Appearance of Car Front

Now in the Keeton you have a car that combines the very best ideas, both in construction and designing, that have been produced on both continents.

And you buy the Keeton, with these advantages, at the American price.

The Keeton car answers every requirement of those people who want a car of foreign design, yet who feel that they do not want to pay the high prices.



Showing the unusually neat motor

To Dealers!

It is needless for us to say that these cars are selling fast. Nearly two-thirds of our 1913 output has already been sold. And when we say sold we mean contracted and paid for.

This is the one distinct car—the one car that has a demand all its own. It is the one car that has no competition from American cars because of the style and design, and none from the foreign cars because of the price. The Keeton car appeals to the buyer who is accustomed to the best—but who will appreciate a fair price.

The Keeton is selling fast wherever we are showing it. We already have dealers in many localities, and are considering applications from others. It would be well for you to write us about your local territory. We may have a dealer lined up, but will be glad to hear from you anyway.

Keeton Motor Company
Detroit, U. S. A.

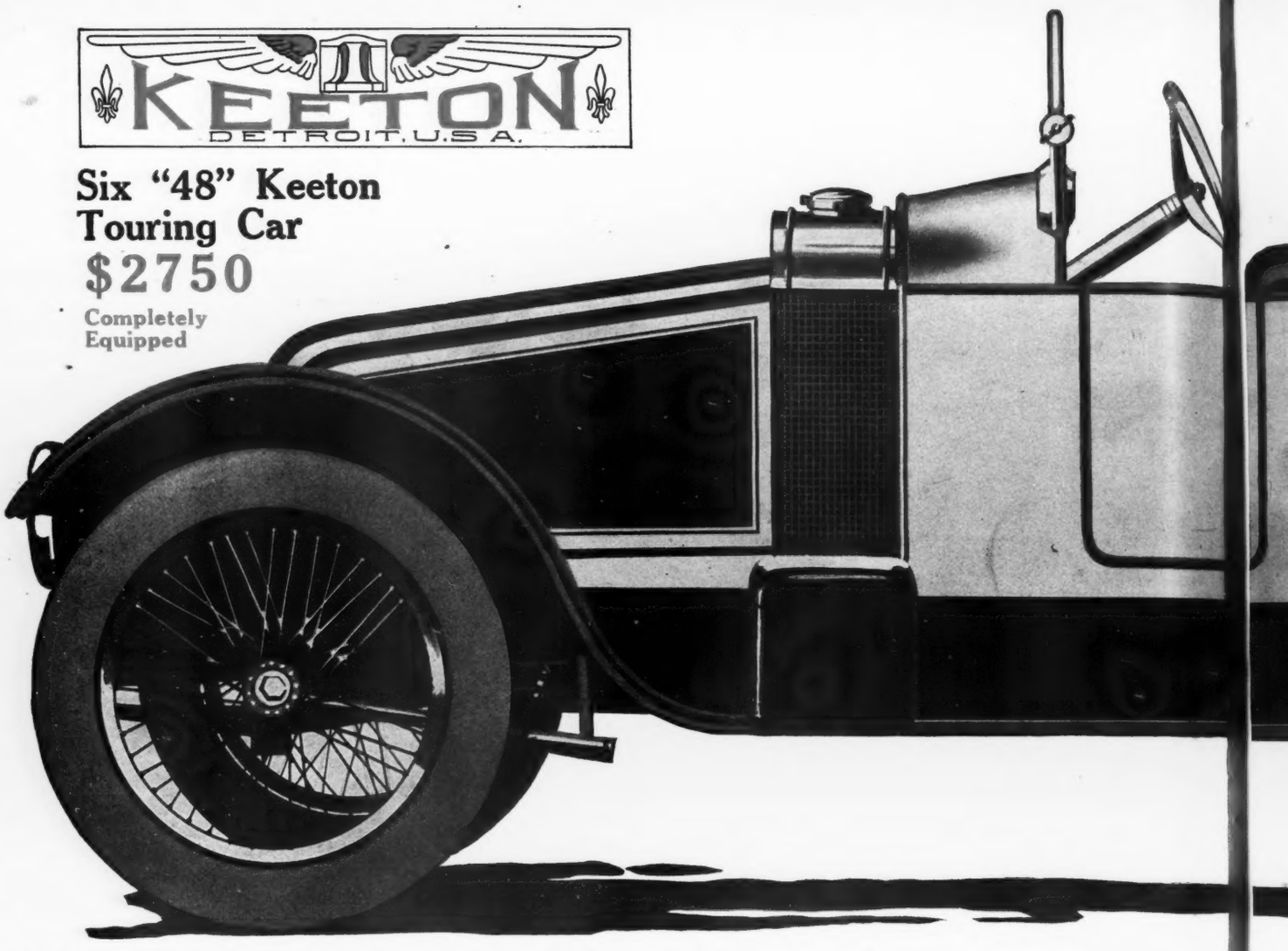
The Keeton Exhibit at the Big Shows Will Interest You!

KEETON
DETROIT, U.S.A.

Six "48" Keeton Touring Car

$2750

Completely Equipped



The Six "48" Keeton Compares

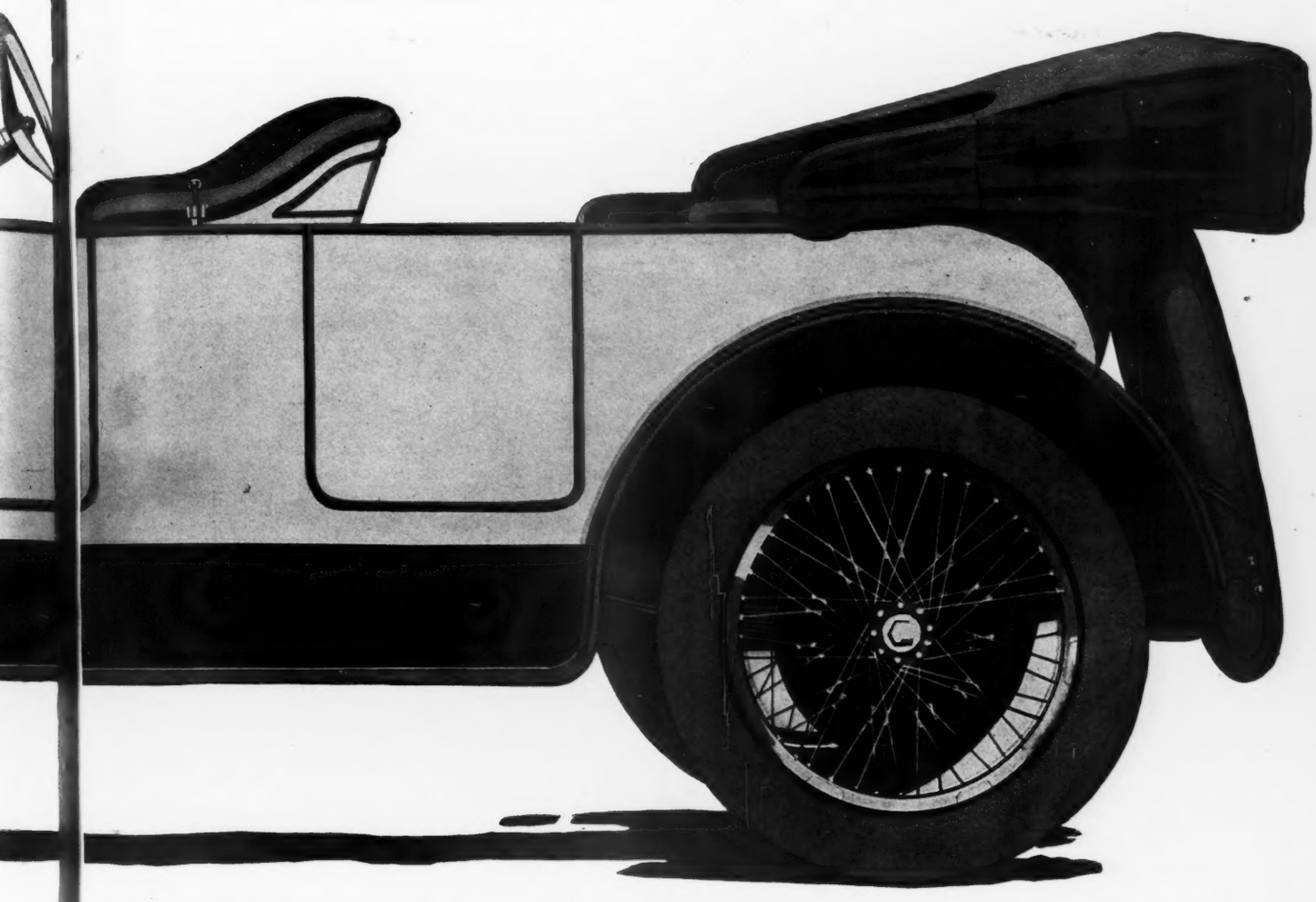
This car is in a class by itself—simply because it is a combination of American and European ideas in engineering and designing, and is made in the economical American way. That's why the price is so low. That's why you get luxury and quality which would cost you nearly three times as much if you bought from an importer.

Here is a car that you are proud to drive anywhere. You have the utmost luxury and comfort—the distinctive appearance. And every detail of construction is of such high quality that the Keeton will give service second to no car in the world.

Compare this car with the best foreign makes—look them over carefully yourself. Go over them point by point and you'll readily see why the Keeton is the ***real sensation*** of 1913. Perhaps you say that such a car cannot be produced, even in America, for such a remarkably low price, but again we say, compare.

Keeton Motor Comp

The Keeton Exhibit At the



With the Best Foreign Cars!

In fact, the Keeton is a car of true foreign type, built to stand American road and touring conditions. It is unusually light for a car which will accommodate seven passengers, weighing only 3350 pounds, a construction which enables it to stand the hardest driving over the most unsatisfactory roads.

You'll notice several features of the Keeton which are entirely new for American built cars. But when you consider them carefully, their superiority is obvious. The radiator at the rear of the motor means perfect cooling, without drawing dirt and dust into the hood, and also eliminates the fan equipment. Then, too, the radiator is protected. The transmission and axle bearings throughout are imported Annular.

Again we ask you to compare the Keeton—for it is only by comparison that you can realize the great value we are offering. We will make only a limited number this year, and, of course, your order should be in early. Let us send you booklet describing the different models.

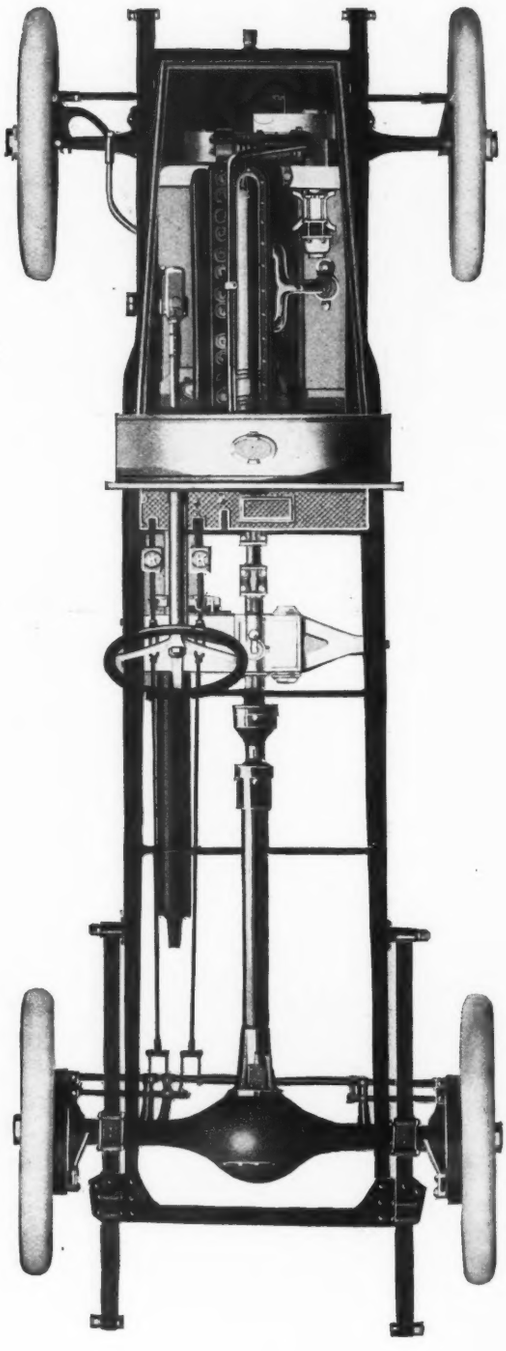
any, Detroit, U. S. A.

Big Shows Will Interest You!

KEETON
DETROIT, U.S.A.

The Six "48" Keeton

Electric Starting
Full Electric Light Equipment
Transmission—four speeds forward
Wire Wheels—with option of Wood Wheels
Chrome Vanadium Gears and Shafts on Imported Annular Ball Bearings.
Extra Detachable Wire Wheel, or Extra Demountable Rim
Long easy riding Springs—long wheel base
Left Hand Drive—Center Control
Small bore—long stroke motor, of exceptional power and flexibility
Radiator at rear of motor—in proper and protected position
The only true French type of car built in America
Best of foreign practice adapted to American road and touring conditions



Complete Equipment

Electric starting and lighting system, with 12½ inch head lights; tail lamp with license holder; 80 mile Speedometer and eight day clock combined with electric light; Lamp for changing tires at night, with extension cord; Dynamo electric Horn; Robe and Foot Rails; Silk Mohair Top, with self contained folding curtains and slip cover; Double acting, rain vision Windshield; Option of Wire Wheels with extra detachable Wire Wheel, or Wood Wheel with extra demountable rim; Wheel or Tire Carrying Irons; Full Set of tools; Pump; Jack and Tire Repair Outfit; and all Touring Bodies will take Auxiliary Seats.

Three Excellent Models

Riverside Touring Car, 5 passenger, Completely Equipped	$2750
Two extra folding seats for above	$25
Meadowbrook Roadster, Completely Equipped	$2750
Tuxedo Coupe, Completely Equipped	$3000
Chassis without tires or rear guards	$2250

All Prices f. o. b. Factory. Booklet on Request

Keeton Motor Company
Detroit, U. S. A.

The Keeton Exhibit at the Big Shows Will Interest You!

Marathon

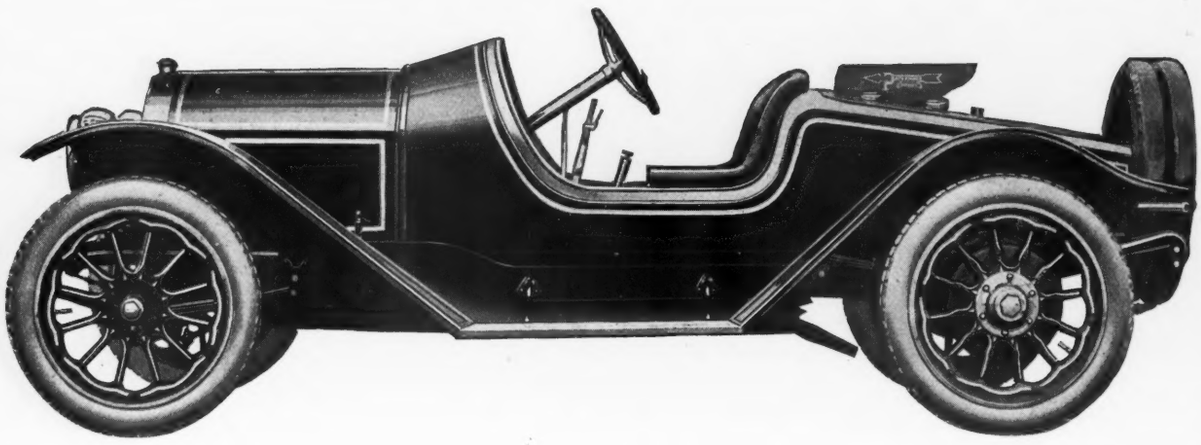
The Marathon Motor Works will exhibit its comprehensive line of automobiles, consisting of 10 attractive models, at the

New York Show
Space 130
Mezzanine Floor
Grand Central Palace

To Dealers and Agents who are interested in a line that meets most every sales demand, Mr. H. H. Brooks, General Sales Manager, will be glad to extend a personal welcome.

Marathon Motor Works
Nashville, Tennessee

PATHFINDER



The Pathfinder "40" Cruiser will be the sensation of the New York and Chicago Shows

An Appreciation

YOU who are accustomed to the best will find your ideas of distinction most fully expressed in the many beautiful models of the Pathfinder. The ability to create cars entirely different, yet dominately attractive, has placed the Pathfinder foremost among the recognized quality leaders of the world. This distinction of design is coupled with chassis construction which mechanical experts have pronounced the finest blending of American and European engineering. Add to this the prestige that goes with ownership of the official car of the U. S. Government and A. A. A. and you will understand why every Pathfinder owner expresses his satisfaction in words of unstinted appreciation.

The first step toward a complete understanding of the superiority of Pathfinder construction is the reading of "101 Reasons"—this is a universal guide for the judging of automobile values. To obtain a copy fill out the attached coupon.

THE MOTOR CAR MFG. CO.
INDIANAPOLIS

(M A)
THIS COUPON
properly filled out entitles you to a copy of the Pathfinder booklet, "101 REASONS."

Name_____

Address_____

The Motor Car Mfg. Co., Indianapolis.

(M A)
THIS COUPON
properly filled out and presented at our exhibit in New York or Chicago entitles you to an advance copy of the **"Photo Story of a Pathfinder."**

Name_____

Address_____

The Motor Car Mfg. Co., Indianapolis

SPEEDWELL "SIX"
5-passenger completely equipped, $2850

135 Inch Wheel Base, 36x4½ Tires, Electric Self Starter, Electric Lights, Independent Bosch Magneto Ignition

See the Real Motor Car Sensation of the Century

The New Speedwell "Six"
with
Mead Rotary Valve Motor

THE biggest innovation in the history of the motor industry makes its first appearance at the New York Pleasure Car Show (Grand Central Palace Division) in this big superbly appointed Speedwell "Six" equipped with the Mead Rotary Valve Motor.

Allowing due deference to public opinion we are offering in conjunction with the Mead Rotary Valve Motor, a standard high powered six cylinder poppet valve motor in our standard Speedwell Chassis.

The buyer has an option of selecting either poppet or rotary valve motors on any Speedwell Six model at exactly the same price.

The Mead Rotary Valve Motor

The primary advantages of this motor are silence, simplicity, freedom from wear, and lack of vibration.

Between 200 and 300 less parts than are required for the prevailing types of six cylinder poppet valve motors.

No reciprocating parts in valve construction.

Valves revolve at one quarter of crank shaft speed.

Valves cannot get out of time—once set, always the same.

No valves to grind and practically no wear; valves that have been driven *100,000* miles show full efficiency.

Power developed is in excess of other motors of equal piston displacement.

A really marvelous motor—simple in the extreme.

We can't convey any adequate idea of this motor's value in cold type—*See it at the show—Send for literature.*

4 and 5 Passenger Models $2850—Fully Equipped
7 Passenger Model $2950—Fully Equipped

Our Exhibit

at the Grand Central Palace, Space 28, January 11th to 18th, includes a Poppet Valve "Six," a Mead Rotary Valve "Six" Chassis and complete cars.

The Speedwell Motor Car Company, 20 Essex Avenue Dayton, Ohio

A Safe, Powerful and Silent Car

The element of greater safety that the Underslung construction insures is in itself of such value as to cause any discriminating motorist to demand an Underslung—the factors of more, continuous, better power and absolute silence are certainly sufficiently advantageous to warrant a motorist in demanding a Six.

And to have these two universally admitted advantageous principles of construction embodied in a single car one must have the

NORWALK UNDERSLUNG SIX

In the Norwalk will also be found every advantage that could possibly be desired—all the latest tried and proven developments that add to the comfort, luxury and refinement of a car—electric starter, electric lighting system, electric horn, cigar lighter, deep upholstery, etc.

Aside from this, the Norwalk with its beautiful lines, long, low, rakish appearance has a character and individuality so distinctive, so compelling and so vividly impressive as to win favor wherever it goes.

It has ample power to take the big hills "on high." It will carry you along over the stretches at an exhilarating, "mile-a-minute" clip or better, and yet it is so flexible that it can be throttled down slower than a walk and all the time it is noiseless, economical, substantial, dependable, sensitive and obedient.

The Norwalk Six is indeed

The Car of Absolute Exclusiveness

We are this year furnishing the Norwalk with two sizes of motors, three lengths of chassis and six different bodies, each model designed to fulfill every requirement of a motorist who demands a car that is distinctive, reliable, powerful, comfortable and refined in every detail of appointment.

Every motorist should read the unbiased, non-technical treatise that we have issued on the principles of Underslung construction. A copy to any person upon request. Also let us send you our literature, which describes in detail the many advantages of the Norwalk We have a few desirable territories still open for reliable dealers. Particulars upon reques

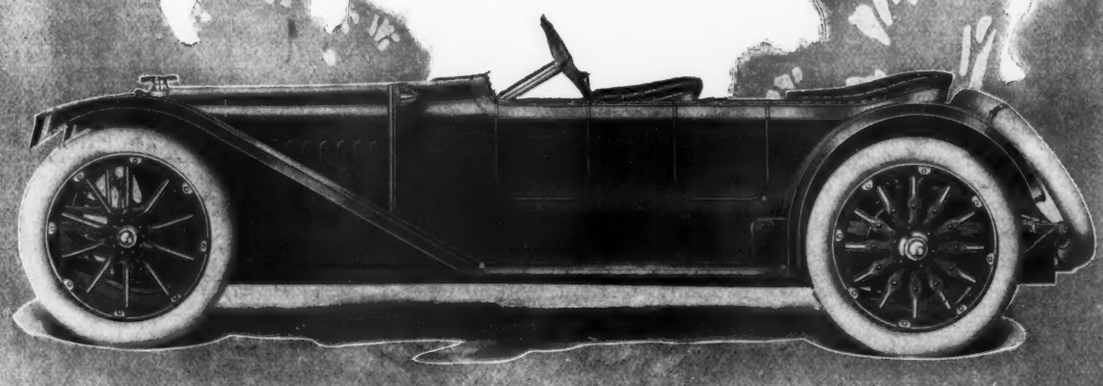
Norwalk Motor Car Company

1019 Winchester Ave.,

MARTINSBURG, W. VA., U.S.A.

Export Dept., 17 Battery Pl., New York City

CABLE ADDRESS
"Norwalk
Martinsburgwestvirginia"



Marion

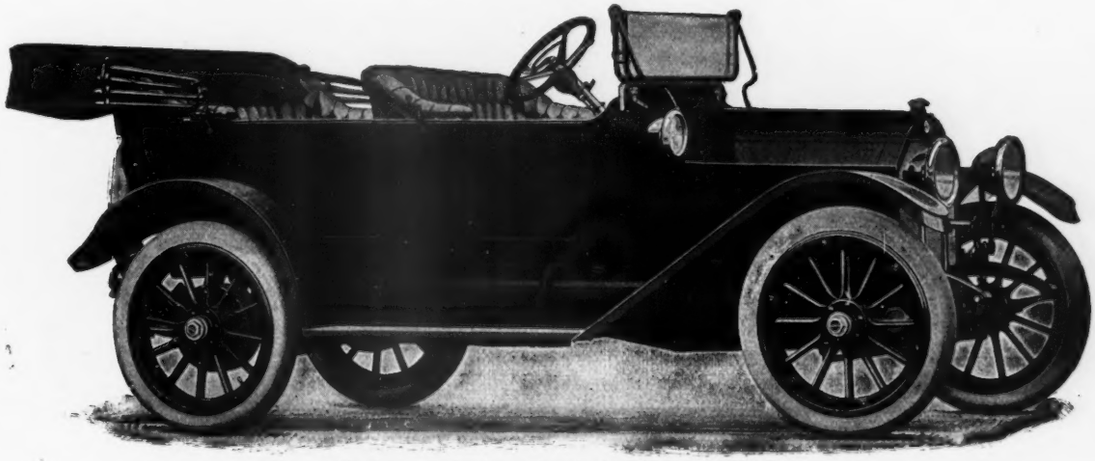
You Can Buy a Duplicate of Any Marion Show Car

1913 Marion show cars are typical of the entire Marion product. You can purchase any of the Marion cars on exhibition, or get a duplicate of any model from any Marion dealer.

Every show in the 1913 circuit will have stock Marion cars, but in beauty of line and finish and in completeness of equipment, they equal any cars which are especially prepared for the show season.

This accords with the Marion policy of giving to purchasers and dealers the very best workmanship, attention and finish attainable. These cars are made in the largest automobile factory in Indianapolis; they have been built successfully for 10 years, and they are better now than ever.

Do not miss seeing Marion cars at the show—or see ones just like them in our dealers' show rooms. At New York they appear in the Grand Central Palace. In Chicago at 2450 Michigan Avenue.



Marion 37-A, Completely Equipped, $1475

1913 Marion cars are pre-eminent because of their graceful appearance, beautiful finish, class and luxury. They are powerful, sturdy and strong. The completeness of their equipment alone would make them notable.

There are four body models: 37-A, 30-40 h. p. five passenger touring car, $1475; 48-A, 48 h. p. five passenger touring car, the Marion "de luxe," with electric self starter, $1850; the famous Marion "Bobcat" speedster, 30-40 h. p. $1425 and the latest Marion 38-A, 30-40 h. p. fore-door roadster, $1475.

These cars are built expressly for those who require reliability, comfort, style and full value for the money. Their position in the 1913 line-up is unique. They have always been manufactured with unusual quality. In equipment they have no superiors. As to their standardization and success, there has never been a question. To produce and market the 1913 series, we have increased our capitalization one million dollars and have recruited experts from the oldest and biggest factories in the industry.

We cannot begin to enumerate all the points you will note and immediately like about the 1913 Marion. See them at the shows, or let us send you illustrated literature. We offer the fairest sales agreement ever written. If you are a dealer, do not allow this opportunity to pass.

Disco Self Starter.
Prest-O-Lite Tank.
Warner Speedometer.
Nickeled Trimmings.
Tools, Tire Irons.
Center Control.
Dynamo Electric Lighting System.
Q. D. Demountable Rims, One Extra.
Mohair Top, Boot, Storm Curtains.
Brewster Green or Deep Wine Color.
Plate Glass Windshield.
Concealed Tool Boxes.
Ample Power.
Long Easy Springs.
Comfort, Dependability.
Quietness, Simplicity.
Deep Upholstering.
Plenty of Room.

THE MARION MOTOR CAR COMPANY

902 Oliver Avenue **Indianapolis**

Electrically Lighted

AMERICAN UNDERSLUNG

Electrically Started

The "American Tourist"—$2350 Complete.

The most practical car to drive

"American Underslung"

Ninety-six per cent of the motor's power is transmitted by direct drive to the rear system.

The center of gravity is only 21.9 inches off the ground. Sidesway is decreased over 50 per cent. Strains are divided equally and control made positive at high speeds.

No danger of turning turtle. Right angle turns may be taken at 45 miles an hour.

"American Underslung" big wheels guarantee maximum comfort. Experiment on wooden floor cracks with a caster and a bicycle wheel.

"American Underslung" tires have a contact surface of 6 inches. The greater the contact surface the less tire wear.

Road clearance is 12¼ inches.

Conventional Overhung Car

One-fifth—20 per cent—of the motor's strength is actually wasted by indirect drive.

The center of gravity is 30.2 inches off the ground —8.3 higher than in the underslung. Control at high speeds is extremely hazardous—strains unevenly divided.

Speed from 10 to 20 miles an hour less in order to guarantee equal safety.

Wheel size is limited. Therefore, comfort is a finite quantity.

Overhung cars have an average tire contact surface of only 4½ inches—30 per cent less than those on the "American Underslung."

Road clearance of 85 per cent of all overhung cars is 11¼ inches.

This is a bigger "American Underslung" year than ever. Get into communication with us today. See our big exhibits at the New York and Chicago Shows.

The "American Traveler"—$4500 Complete.

The "American Scout"—$1475 Complete.

American Motors Company, Dept. H, Indianapolis, Indiana

Compare this Delivery Car with Any Delivery Car Selling at Its Price

Lippard-Stewart

The Delivery Car

CHASSIS
List - - $1650

BODIES
Standard Panel - $150
Standard Express $125

The Lippard-Stewart Model "P" 1500 lb. Delivery Car 30 Horsepower

Efficiency Goes Deeper Than Paint. How a car looks and what a car does are two vitally different features, and you are shrewd enough business man to realize that any car that has a clear record behind it must have imitators. We admit this fact in connection with the Lippard-Stewart Delivery Car, but we affirm that no imitation includes in its construction the vital features that have made the Lippard-Stewart Car a leader. The similarity lies in price and appearance only.

What This Car Can Do is not mere conjecture. It is fact based upon actual performance. It has been proven in many instances that the Lippard-Stewart Delivery Car will do as much work as three horse drawn vehicles—that it will go faster and farther—that it will deliver more goods over a wider territory in less time and at a less cost per package. It has been proven time and again that this car actually pays for itself in the increased business it makes possible and the money that it saves. This in conjunction with the fact that first cost of the car is low and its subsequent upkeep economical are the reasons for its popularity with up-to-date, thinking, business men.

Examine the Construction of the Car. Go over every last detail of workmanship and engineering, and you'll easily discover why the Lippard-Stewart is a serviceable and dependable car. Examine its chassis, a delivery vehicle chassis through and through—not a compromise with a pleasure car. Strong, yet simple in construction—the frame built heavier and wider at the point of greatest stress. Note the 30 h. p. Continental motor—the rugged cone clutch—the transmission, ample enough for a 50 h. p. car. Look at the shaft drive and the differential gears. Note the left hand drive—the center control and even the brake equalizers. Here are refinements of construction that show unmistakable evidence of expert delivery car building.

Consider the Price of the Car, its actual, tangible, sound dollar for dollar value—the appearance—workmanship—the engineering—the record and the worth of the Lippard-Stewart 1500 lb. Delivery Car as compared with any car apparently competing with it. Consider all these points carefully. As a purely business proposition, can you get more for your money? Then as a dealer form your own conclusions as to the ready salability of the car—the quick turnover of invested capital it assures.

Note the Comprehensive Lippard-Stewart Line—the volume of sales it makes possible—a line that offers you a car to meet the specific demands of practically every firm and individual who need a delivery car regardless of their business. A line that will build you a profitable and increasing business upon the firm basis of satisfied customers.

Read These Special Features of Lippard-Stewart Construction. Continental 30 H. P. Motor, Eiseman Magneto, Brown-Lipe Selective Transmission, Cone Clutch, Full Floating Timken Rear Axle, Timken Roller Bearings throughout, Special Spring Suspension, Left Hand Drive, Pneumatic Tires 35x4½ Front and Rear—full equipment of Lamps and Tools.

We Want Good Dealers Everywhere. We have a splendid opportunity to offer first-class up-to-date energetic men—men who can measure up to our standard of integrity and business ability. If we have no dealer in your town and if you are the logical man to represent us—a man who can grasp the big possibilities of our proposition and handle it in the way it should be handled, wire us instantly.

See Our Exhibits at the New York, Boston and Chicago Shows

Lippard-Stewart Motor Car Co.

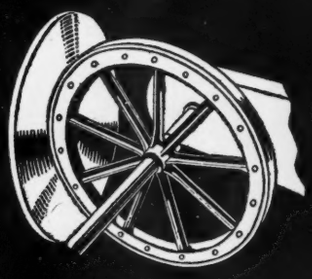
Buffalo, New York

Manufacturers of 1500 lb. Delivery Cars of Every Description

AUGUST BECKER, President. E. J. BARCALO, Treasurer.
J. C. MILLAR, Secretary. C. S. DAHLQUIST, Chief Engr.
W. F. REYNOLDS, Sales Manager.

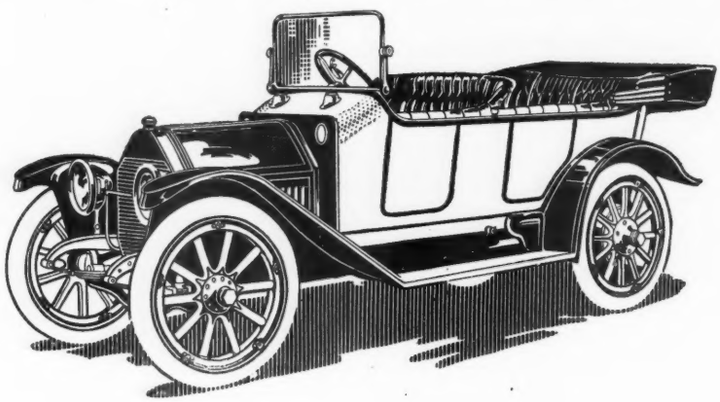
LIPPARD-STEWART MOTOR CAR CO. (M.A.)
Buffalo, N. Y.
Please send catalogue and dealer's proposition.

Name .....
Street .....
City ..... State .....



The Gearless Transmission!

This is the car that will give you the best possible service under all conditions, because of the efficient and strong transmission. The Cartercar is strong just where the ordinary car is weak. It is simple, easy to drive, and always ready to go over any roads.



Greater Efficiency

A Cartercar has an unlimited number of speeds —one lever control—and will easily climb a 50% grade. The transmission is composed of only two unit parts—which must mean great reliability. Just consider what these features must mean to you.

Greater Tire Mileage

The Tires on your Cartercar will wear about twice as long as on a gear car. This is because the transmission eliminates all jerks and jars in starting and changing speeds.

Electric Starting

Whether the weather is warm or cold, all you have to do to crank the motor is merely push down a small knob. Then turn this same knob and you light all or as many of the lamps as desired.

Four Excellent Models

The new Cartercar line includes four extremely good models—Touring Car, Roadster, Coupe and Sedan. They are finished elegantly, and with unusually deep upholstering and attractive lines. The prices range from $1600 to $2000, including complete equipment.

At All The Big Shows!

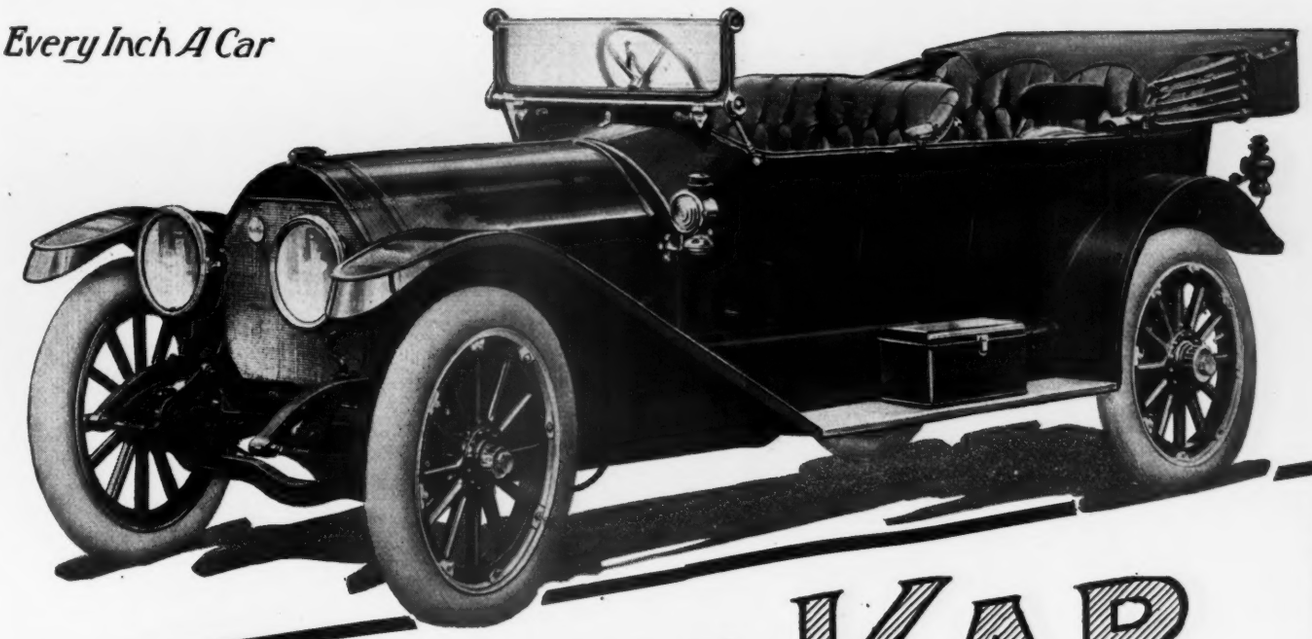
Cartercar

Cartercar Company

Pontiac, Mich.

Branches: New York, Kansas City, Detroit, Chicago, Atlanta

Every Inch A Car



KISSELKAR

The car of dominant comfort and distinction

The appearance of the KisselKar is singularly striking—its riding comfort is unapproached. Both these elements of greater motor car value are secured by the generosity of KisselKar design. The wheelbase of every KisselKar model is extra liberal. Every extra inch means a steadier riding motion, and permits the car to be designed on more liberal lines, with roomier tonneaus and deeper seats. Besides adding greatly to comfort the liberal wheelbase permits longer, more rakish lines, which give the KisselKar such special distinction.

Next to the special comfort and distinction of the car itself, comes the extraordinary service extended to owners. KisselKar service is supplied by the manufacturers who maintain a national service organization including specially equipped buildings at principal points with factory-trained men, who cooperate with agencies in keeping your car under constant observation, preventing interruptions, minimizing maintenance and retarding depreciation.

"Thirty" $1700 "Forty" $2000
"Fifty" $2500 60 H. P. "Six" $3150

ELECTRIC STARTED AND LIGHTED
FULLY EQUIPPED AND APPOINTED

Write for 1913 catalog—illustrates and describes entire KisselKar line—It will give you a new standard by which to judge automobile values.

The KisselKar at the Shows

Pleasure Cars

New York—No. 22 Grand Central Palace.

Chicago—No. M-1 Coliseum Annex.

Trucks

New York—No. 113-A Madison Square Garden.

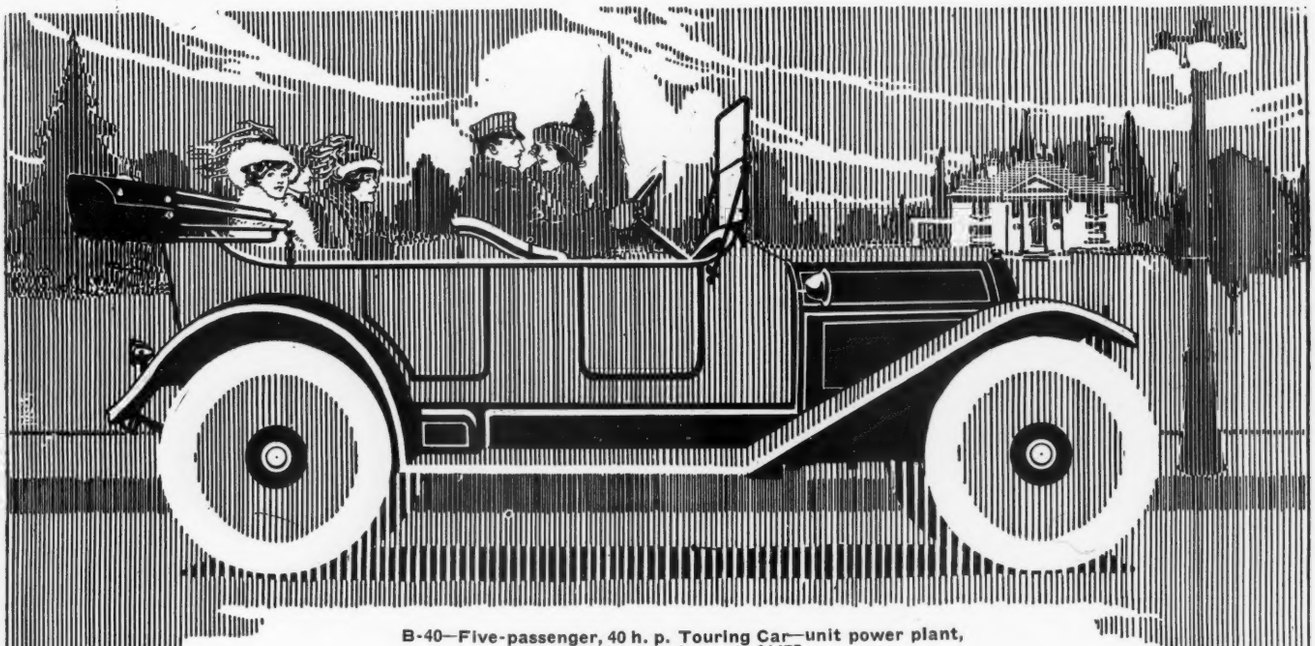
Chicago—Section C. Coliseum.

1500 lb. 1, 2, 3, 4, 5 Ton Trucks.
Fire Dept. Apparatus, Ambulances, Hearses, Patrols, etc.
KisselKar Trucks and Delivery Cars are operating in every line of business—all type bodies. Special bodies designed to meet special needs. Write for truck catalog.

Kissel Motor Car Co., 121 Kissel Ave., Hartford, Wis.

BOSTON NEW YORK CHICAGO MILWAUKEE KANSAS CITY LOS ANGELES MINNEAPOLIS ST. PAUL DALLAS

Philadelphia, Cleveland, Detroit, El Paso, San Antonio, New Orleans, Baltimore, Omaha, Butte, Denver, San Francisco, Seattle, Portland, Duluth, Buffalo, Pittsburgh, Hartford, Conn., New Haven, Albany, Troy, Montreal, Quebec, Toronto, Winnipeg, and 200 other principal points throughout America.



B-40—Five-passenger, 40 h. p. Touring Car—unit power plant, complete equipment—$1475

A-40—Two-passenger Roadster on same chassis—$1475

Real Evidence of the Unusual Value in

Cutting

MOTOR CARS

When you inspect the Cutting for the first time, you will find it fairly bristling with the evidences that stamp it the superior of cars of like price.

You will encounter them all through the car—all evolved by years of experience and all refinements that make for increased comfort, increased convenience and economy of operation, increased safety for the passengers and longer life for the car.

For example, the rear crankshaft bearing is 4 inches long—quite unusual for a four-cylinder motor. The other two are correspondingly liberal—2¾ inches—and all are of Parsons white bronze.

The intake manifold is water-jacketed its entire length—always warm when the motor is running and making complete the vaporization of the low-grade gasoline now in use.

Motor cooling is assisted by longitudinal ribs on the exhaust manifold, the hottest part of the motor.

The self-contained force feed type of lubrication in connection with the cutting is another feature of especial importance. This method of lubrication is not only the most practical but the most efficient and economical ever devised, one gallon of oil averaging 500 to 600 miles.

Our brake equalizing system assures the same amount of brake pressure on each rear wheel, which helps eliminate skidding. Not only is the brake action smooth and easy, but always positive.

Forty horsepower motor, wheelbase of 120 inches, self-starter, electric lights, 10-inch cushions, 36x4-inch tires, complete equipment and black and nickel trimmings—these are some of the other evidences that will impress you, in the sum total, with the Cutting's extraordinary value.

Sincerity of effect, and an organization that works as one man to attain one end—and that end an ideal of quality—these are responsible for the Cutting at $1475.

We want you to see the car—at one of the shows or at the Cutting dealers—and we want to send you the literature.

New York Show, Grand Central Palace, Space 19

Chicago Show, First Regiment Armory, Space E-4

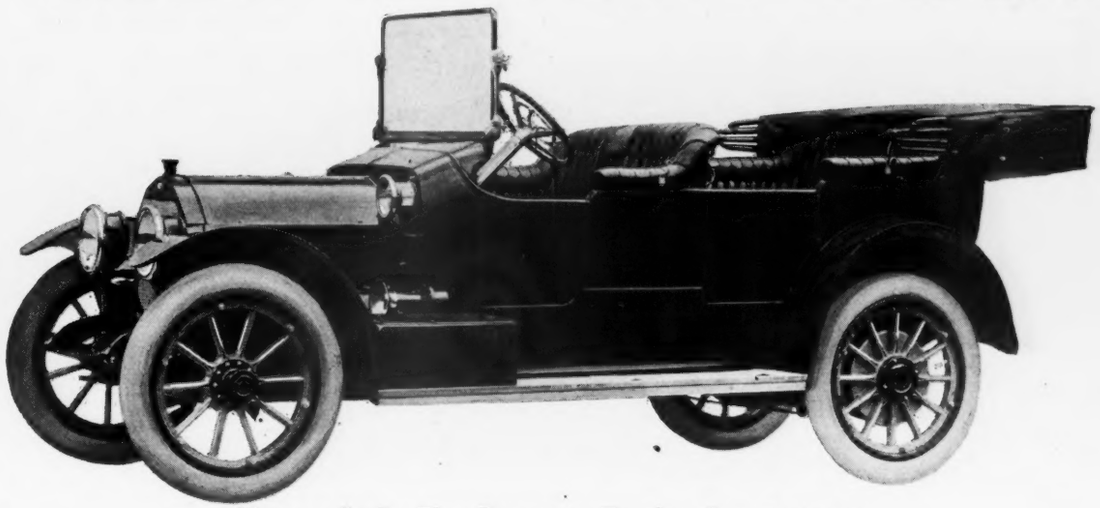
CUTTING MOTOR CAR COMPANY

300 MECHANIC STREET **JACKSON, MICH.**

Canadian Distributors, CUTTING MOTOR SALES CO., Toronto, Canada

"The Easiest Riding Car In The World"

THE MARMON



Marmon "32"—Five Passenger Touring Car—$3,000.00

The Man Who Knows

Have you noticed the *change* in the automobile business?

A short time ago it was a question of selling a car to a man who knew nothing of automobiles—of their construction—of the *true* meaning of service.

Price was the first great question—or perhaps a car sold on its *appearance* alone—or because of its *equipment*—or because of one or two features that struck the fancy of *the beginner*.

Today the greatest proportion of buyers *know* the *real, vital propositions* that go to make automobile value. *One half* the buyers of automobiles have already owned a car.

You are selling to *"The Man Who Knows."*

The greatest percentage of today's buyers *know* how to size up a car—*know* how to judge its design, its construction—*know* it from the *actual* service it has given.

There lies the unequaled *advantage* of the Marmon. It is backed by the *prestige* of the Marmon name. The *superiority* of its design and construction is acknowledged everywhere by experts. Its records in the world's greatest contests have *proven* its unequaled durability. Its records of service in the hands of owners have *strengthened* and *added to* its reputation.

The more a man *knows* about automobiles the more he will be *impressed* by the Marmon in every feature.

Such a car *cannot be assembled* even from the best products of several manufacturers. It must be designed and constructed *complete* by one organization with extraordinary care and thoroughness *in every step* of its manufacture from the skilled engineer's drawing and the raw material to the completed car.

Nor can such a car be turned out *by the thousands* to meet the low initial price required by the *inexperienced* buyer.

Sixty years of experience in the manufacture of high class machinery, sold in every part of the world, have taught us that there is but *one* way to construct a machine to give *constant* service. The fruit of this experience is the *high standard* of Marmon construction.

You, who buy cars, know as well as we, who *make* them, that there is but *one* way to give satisfaction in an automobile—and that way is to make it, with every care, for years of service.

You wise buyers—"The Men Who Know"—are looking forward into the future. The day of the car with Marmon reputation behind it and Marmon service in front of it is just *dawning*.

The Marmon "32"

32-40 h. p., 120-inch wheelbase, dependable electric starting and lighting system, left-hand drive, center control, nickel trimmings, with newest body types to meet every requirement and corresponding equipment—

$2,850 to $4,100

The Marmon Six

48-80 h. p., 145-inch wheelbase, dependable electric starting and lighting system, left-hand drive, center control, nickel trimmings, with body types to meet every requirement and corresponding equipment—

$5,000 to $6,350

Detailed Information on Request

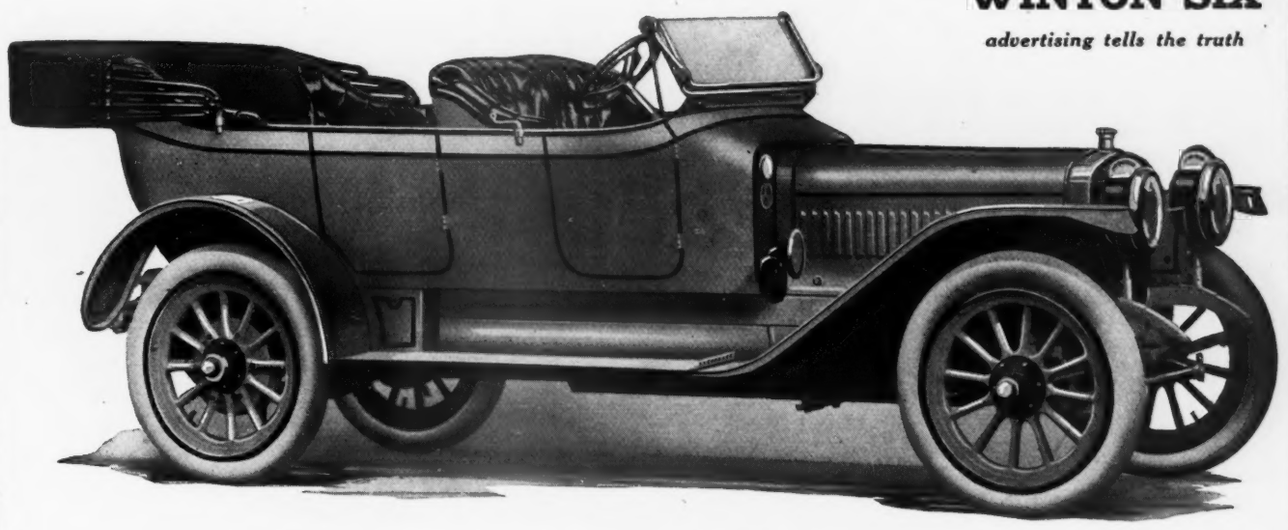
Nordyke & Marmon Company

Indianapolis (Established 1851) Indiana

Sixty Years of Successful Manufacturing

WINTON SIX

advertising tells the truth



Repairs Cost 29.2 Cents per 1000 Miles

In a repair expense test, extending over five years, during which the distance traveled was more than one million miles, seventy Winton Sixes, driven in the service of individual owners, established the world's lowest repair expense record of 29.2 cents per 1000 miles. Here is the five-year summary:

Year.	Cars.	Total Sworn Mileage.	Total Sworn Repair Expense.
1912	20	290,759	$131.98
1911	20	394,333.9	20.88
1910	10	165,901.9	6.96
1909	10	118,503	127.30
1908	10	65,687.4	15.13
Totals	70	1,035,185.2	$302.25
Grand average		29.2 cents per 1000 miles	

Every car owner made **sworn** statements of his mileage and his repair expense. We have put all these statements in our Upkeep Book, which is just off the press, and we shall be glad to send you a copy. We want you to get acquainted with the only car in the world whose makers are not afraid to find out and to publish its repair expense cost. Write today.

The Winton Motor Car Co.

424 Berea Road, Cleveland, Ohio

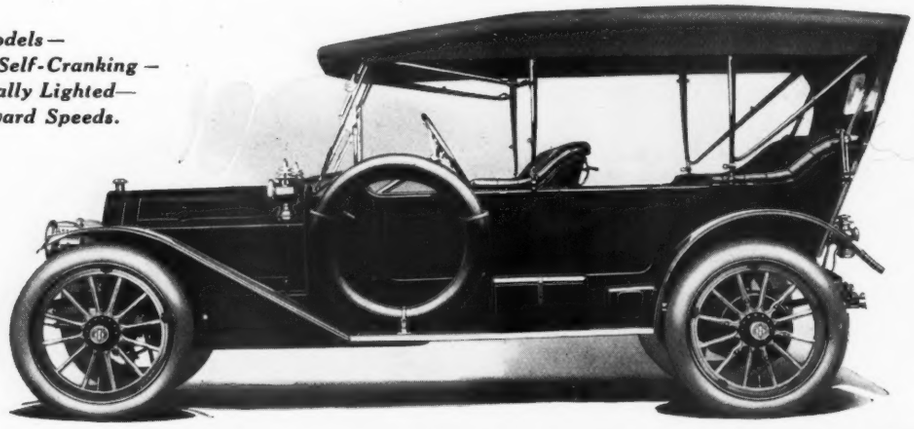
Winton Company **Branch Houses** in New York, Chicago, Boston, **Philadelphia, Baltimore,** Pittsburgh, Cleveland, **Detroit,** Milwaukee, Minneapolis, Kansas City, San Francisco and Seattle.

Herreshoff

The Thoroughbred Car

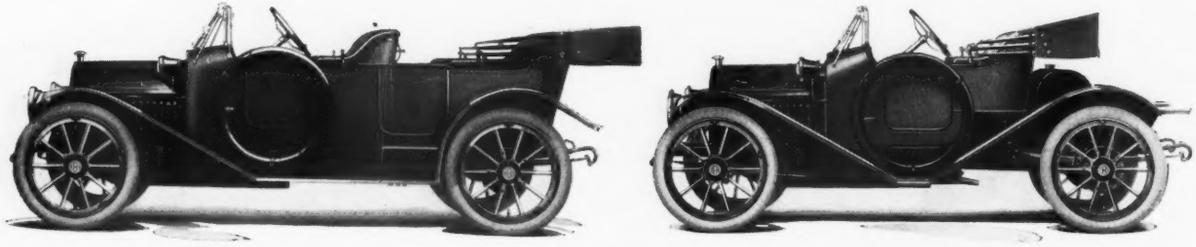
Herreshoff's Fifth Year of Successful Manufacture of Automobiles

1913 Models—
Electric Self-Cranking—
Electrically Lighted—
4—Forward Speeds.



Herreshoff "Six-36"—Electric Self-Cranking, Electrically Lighted — Touring Car. Four Forward Speeds—Price, complete, $1850

Six-Cylinder, Long Stroke, T-Head Motor. Valves Enclosed. Three-Point Suspension. Four-Speed Transmission. Left-Hand Drive. Right-Hand Control. Full Platform Springs. 124-in. Wheelbase, 34x4 Demountable Rims and Tires. Westinghouse Ignition and Lighting System. Herreshoff-Westinghouse Electric Self-Starter. Body with Shrouded Dash. Clear Vision Windshield. Electric Lights. Electric Generator and Storage Battery. Top, Windshield, Speedometer, etc. Guaranteed weight, ready for the road, under 2,800 pounds. Full Nickel and Black Enamel Finish. Price, complete, $1850, f. o. b. Detroit.



Herreshoff Model 30, Four-Cylinder, Electric Self-Cranking, Electrically Lighted Touring Car and Roadster. Four Forward Speeds.

Long Stroke L-Head Motor. Valves Enclosed. Four-Point Suspension. Four-Speed Transmission. Left-Hand Drive. Right-Hand Control. Semi-elliptic Springs Front and Rear. Wheelbase, Touring Car, 110-in.; Roadster, 100-in.; 32x3½ Q. D. Demountable Rims and Tires. Westinghouse Ignition and Lighting System. Herreshoff-Westinghouse Electric Self-Starter. Body with Shrouded Dash. Clear Vision Windshield. Electric Lights, Electric Generator and Storage Battery, Top, Windshield, Speedometer, etc. Full Nickel and Black Enamel Finish.

Price, Complete, Touring Car, $1350. Roadster, $1250, F. O. B. Detroit.

Dealers invited to see the Herreshoff Exhibit at the New York Show, Space 31, Grand Central Palace, and at the Chicago Show, Space 2, Coliseum Basement

Live, energetic dealers wanted in unallotted territory.

Herreshoff Motor Company, Detroit, Michigan

HENDERSON

Every Henderson Car Must Pass These Rigid Tests

When you buy a Henderson, you can be assured that it is **right**—that it has passed the rigid scrutiny of the Henderson Engineering Corps—and that the Hendersons of Indianapolis stand back of it.

Every part of the Henderson is carefully examined and tested and the result noted on production tags as shown herewith. The foreman in charge of each department is responsible for seeing that each car leaves his hands in a thoroughly satisfactory condition. Then the car complete is tested—and each and every detail of construction and finish is gone over carefully. You know what a rigid examination of this kind means.

All Models on One Standard Chassis

TYPE 44
Two Passenger Wood Wheel Roadster...$1385

TYPE 45
Two Passenger Wire Wheel Roadster....$1485

TYPE 46
Five Passenger Wood Wheel Touring Car.$1485

TYPE 47
Five Passenger Wire Wheel Touring Car.$1585

Including top, windshield, speedometer, and Disco Self Starter as noted below.

WARD LEONARD ELECTRIC SELF STARTER
in place of Disco on above models, $100.00 additional

Note These Henderson Specifications

- Dynamo Electric Lights.
- Disco Self Starter.
- Left Hand Drive.
- Single Lever Center Control.
- Long Stroke 4⅛x5¼ Silent Motor.
- 34x4 in. Tires.
- 116 in. Wheelbase.
- Demountable Rims.
- Nickel Trimmings.
- Stutz Rear System.
- Gasoline Tank Under Dash Cowl.
- Three Point Suspension.
- Imbedded Dash Lamps.
- Silk Mohair Top and Top Boot.
- $50 Model B Stewart Speedometer with Grade Indicator.
- One Piece Ventilating Windshield.
- Robe and Foot Rails.
- Completely Equipped.

Henderson De Luxe Models

TYPE 48
De Luxe Wood Wheel Touring Car.....$1685

TYPE 49
De Luxe Wire Wheel Touring Car.....$1785

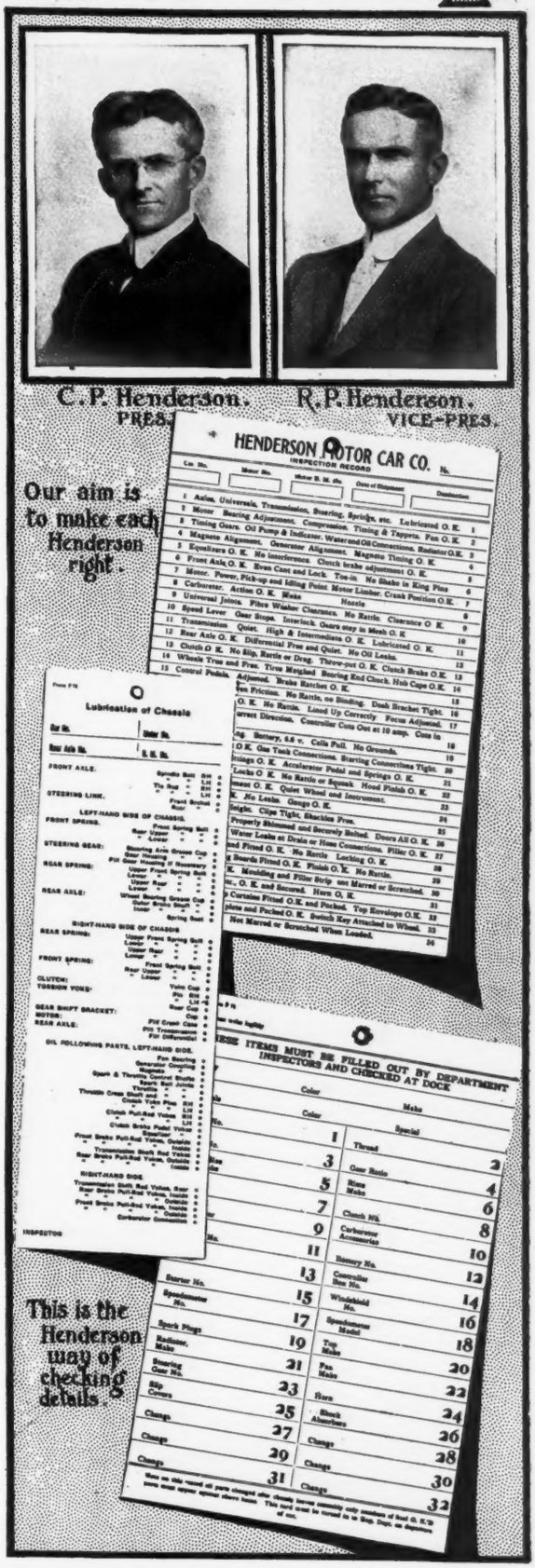
These new De Luxe models have more room in the tonneau and many added features of refinement. De Luxe prices include Ward-Leonard Electric Self Starter. Interesting details sent on request.

With all models on one standard chassis and incorporating the latest proven mechanical and luxury features—the Henderson is proving to be one of the most attractive agency propositions of the season.

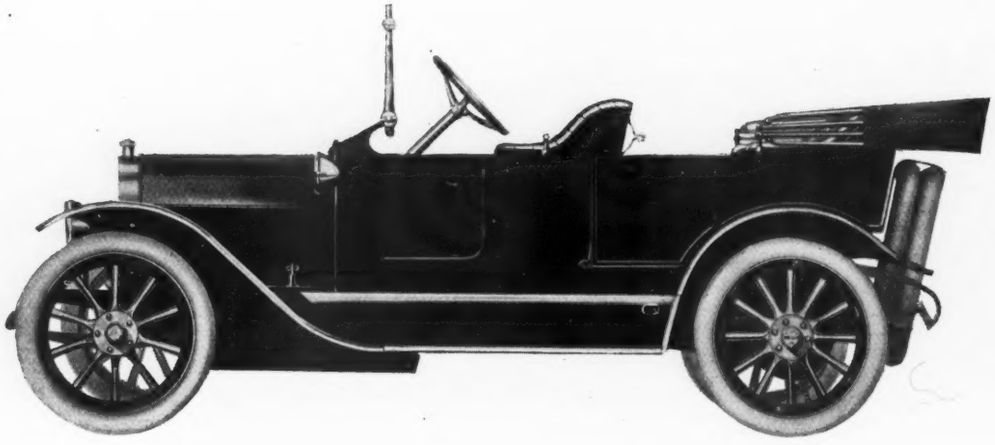
If your territory is open, wire or write at once for full details of our line and a copy of our selling agreement.

New York Exhibit,
Main Floor, Grand Central Palace.

Henderson Motor Car Company
of Indianapolis, U. S. A.



HENDERSON



INTO the MOON 39 (a $1,650 car) are built all these distinguishing features of "high-price" construction.

Long stroke, T-head motor

Full-floating rear axle

Multiple disc clutch

Over-sized transmission and differential

Simple, fool proof, electric cranking and lighting system

Moon Electric Sel-Cranker

The Moon Electric Cranker is so free from complications that it makes no difference which way the two wires from the battery to the starter are connected. No switches on the dash or anywhere else to control the charging of the storage battery—everything absolutely automatic and foolproof.

¶ You can rarely find any of these features in a car sold for less than $2,000. The Moon 39 combines them all for only

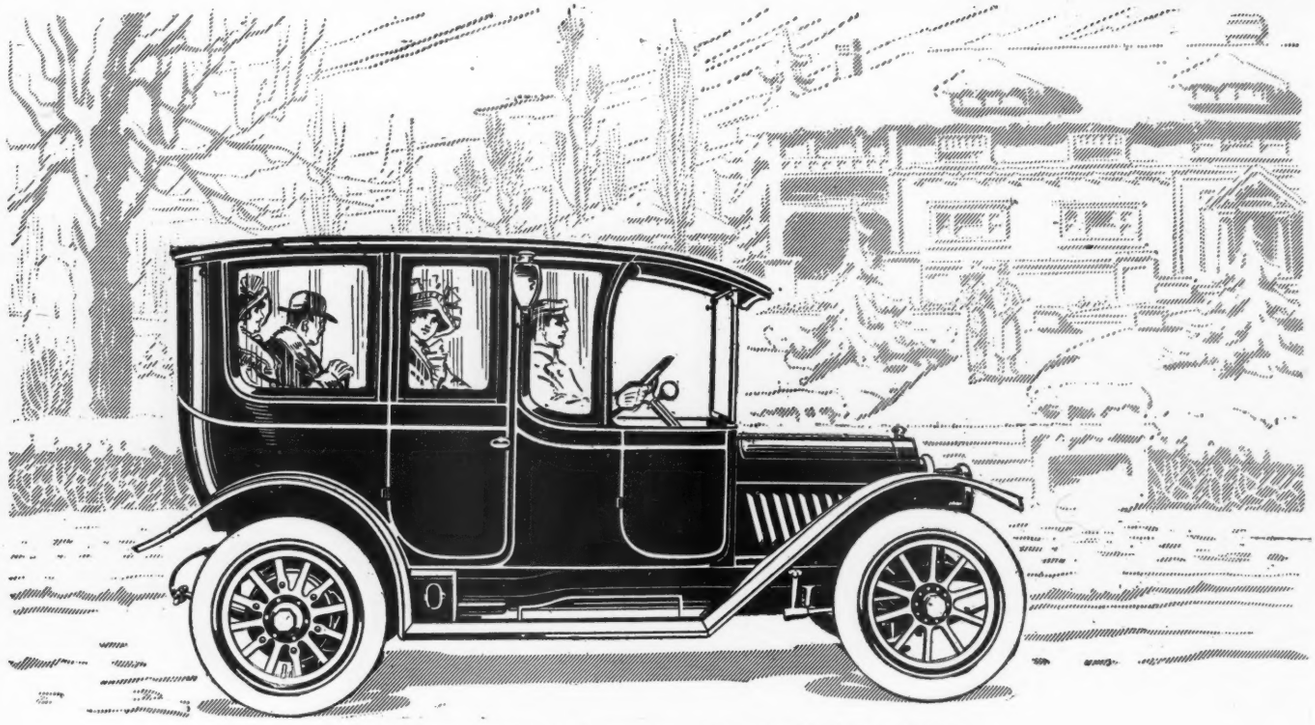
Price, completely equipped, $1,650

The Moon 39 is built in all styles of bodies—touring car, torpedo, roadster, and raceabout. It comes completely equipped—including top, windshield, and speedometer — for $1650. Moon cars are built *right* — without any regard to the cost of construction. The price is set low to insure a big volume of sales.

MOON
Motor Car Company
Saint Louis

$1,650

MOON
Motor Car Company
Saint Louis



Seven-Passenger 44-50 Limousine, 121-inch wheel-base, $3050.

IDEAL WINTER CARS

BEAUTY, STYLE, LUXURY AND COMFORT UNSURPASSED

The 44-50 Limousine and 34-40 Coupe are designed along rational lines. They are inherently beautiful. They possess the natural, easy grace that characterizes all Abbott-Detroit models. Beauty is not found in extravagant lines and designs. The beauty of a perfect horse could not be improved by giving it a camel's back or some other exaggerated form. The artist finds the simplest lines the most beautiful.

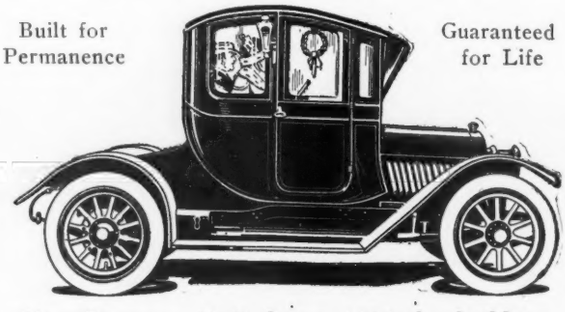
Abbott-Detroit cars show the highest good taste. In keeping with our slogan, "Built For Permanence" and "Guaranteed For Life," they will remain the ideal car season after season. Like a man's derby hat, they will mark the standard of good taste while other styles come and go. Abbott-Detroit models are to the automobile world what Grecian architecture has always been to the world of art. They are the ambition and exaspiration of countless imitators.

To sink in the luxuriant 12-inch cushions is equal to the greatest comforts of the home. Nothing in the way of convenience and comfort has been overlooked. The equipment is the latest and best that money can buy. You have everything that can be found in the highest priced foreign cars.

Remember that the Abbott-Detroit leads in every mechanical perfection. It is the one car with unfailing stand-up qualities. The closed cars are built to withstand the severest weather conditions. To ride in them is like being in a palace on wheels.

Built for Permanence

Guaranteed for Life



Three-Passenger 34-40 Coupe, 116-inch wheel-base, $2000.

Powerful, Silent — Long Stroke—Continental Motors, Electric Lights and Generator, Electric Self-Starter, Underslung Spring Construction, Oversize No-Rim-Cut Goodyear Tires, Booth Demountable Rims, 12-inch Turkish Roll Cushions, Piano Finish and Scores of Other no less Important Features.

Let us tell you about these splendid winter cars.

ABBOTT MOTOR COMPANY, DETROIT, MICH.

The Pilot

"The Car Ahead"

Fourth Successful Year—Three Great Models

Pilot 40, four cylinders, famous Teetor motor, 4½" bore, 5" stroke, 53 H. P., 120" wheel base, large New Departure bearings in wheels, double internal expanding brakes, 14" diameter, 36 x 4 tires. Our great four cylinder car with three years of constant, unfailing service to its owners. Roadster or Touring car. PRICE, $2000.

Pilot 50, four cylinders, Teetor motor, 4½" bore, 6" stroke, 59 H. P., 126" wheel base, five or seven passenger Touring car, 11" cushion in tonneau, large New Departure bearings in front hubs, with Hoffman balls, Hess-Bright bearings with D. W. & F. balls in rear hubs, double internal expanding brakes, 16" diameter, 37 x 4½ tires. PRICE $2250.

Pilot 60, six cylinders, the wonderful new Teetor motor, 4" bore, 6" stroke, 67 H. P., 132" wheel base, five or seven passenger Touring car, 11" cushion in tonneau, large New Departure bearings in front hubs, with Hoffman balls, Hess-Bright bearings, with D. W. & F. balls in rear hubs, double internal expanding brakes, 16" diameter, gasoline pressure feed, 37 x 4½ tires. PRICE $2500.

Electric Lighting—Electric Starter

The famous **Gray & Davis** system of lighting and starting. A more expensive system for lighting and starting to buy than others, but more reliable and efficient than any other. **Power Tire Pump** operating from fly wheel to inflate tires.

Press a Lever to Start Your Motor, to Light Your Lamps and Fill Your Tires With Air

Beautiful upholstered jewel bodies, cushions 11 inches deep and a handsome ventilating windshield of special design are exclusive features.

Every Convenience and Comfort—Every Part of Machinery Accessible Without Soiling a Coat Sleeve

The most beautiful and powerful cars constructed this year. **Teetor "T" Head Motors** in all models, the simplest and most powerful motors built in this country. Not a grease cup on them. **Most perfect Oiling System** ever devised—it cannot go wrong. **Cooling System** so efficient that a Pilot has been operated 4,000 miles in the New England hills the past summer without a fan.

Nickel Babbitt Bearings in motors (not bronze), the best material for bearings ever found. Motor has **150 less parts, weighs 150 lbs. less** and delivers to rear axle (straight line drive) far more horsepower than any other motors of similar piston displacement.

Speed and economy records everywhere. Motor noted for its hill climbing ability.

Won the Algonquin Hill Climb in Chicago three successive years and cut 25 seconds from the previous record for its class at Dead Horse Hill at Worcester, Mass., in 1910.

The Strongest Built Car in America

With a record for unfailing service in the mountains and deserts which have been the graveyard of so many automobiles and where many manufacturers do not care to send their cars. **Let us send the proof.** If you could visit our factory and see the way we construct Pilots, see the materials we use, you would realize why we have a "no trouble" car and why we are selling so many of them in sections where other cars cannot stand the service.

Guaranteed for One Year

Some manufacturers guarantee their cars for several thousand miles. It is **different with the Pilot. You can ride 25,000 miles if you want in one year, either on the Massachusetts boulevards or the deserts of Arizona and Nevada—it does not matter—the Pilot Guarantee is with you all the time. A long list of satisfied owners. Let us send you their opinion of the car.** There is so little trouble with a Pilot that some of our agents are advertising to take care of the car for their customers the first year free of all expense. **How many agents of other cars dare do this? This is the proof of reliability.**

Pilots are not thrown together over night. Every car receives individual attention. We could make many more cars than we do if we made them with "hurry-up" and "get-them-out" methods, but then they would not be Pilots. The buyer who gets one of these good cars has an absolute assurance of the highest quality of service and the minimum of trouble and expense.

THE CAR WITHOUT A MECHANICAL DEFECT

Built To Wear—Not Just To Sell

Read the Specifications

Full-floating rear axles (absolutely guaranteed), chrome nickel steel shaft, 1½ inches in diameter; strongest axle bridge housing on any car; Brown-Lipe differential, famous National oil tempered springs, wheels of great strength with twelve spokes; double internal expanding brakes, Warner transmission (heavy enough for the strongest motor), cone clutch with auxiliary springs under leather facing, making very easy engagement; large size Mayo type radiator, 3⅞ core (German silver); control in center of car for convenience of driver; absolutely reliable irreversible steering gear. Sub-frame construction with shaft and bevel gear drive, and double universal joints between transmission and differential and V-shaped torsion rod to rear axle. Straight line drive and the strongest automobile construction on any car and found only on the very best and highest priced cars. New Departure bearings (Hoffman balls), Hess-Bright and F. & S. bearings used where best adapted for service. Springs, front half elliptic 38 x 2, rear very long half elliptic, 52 x 2 inches, insures easy riding. Genuine white lead and oil paint, 11 inch cushion and heavy Turkish upholstering on handsome jewel bodies, with entrance from either side—an exclusive feature—add beauty and refinement to these wonderful constructed cars.

Regular Equipment for All Models

Mohair top and hood, ventilating windshield, Warner autometer, Stromberg carburetor, Eisemann magneto, tire power pump, electric lights and electric starter (Gray & Davis system), electric and bulb horns, tool kit, tire repair outfit, jack, robe and toe rails, five electric lamps including lights in dash and large electric headlights, quick detachable, demountable rims, Auto Hind Reflector and Never-Out License Brackets, nickel finish throughout. **The most completely equipped car ever sold.** Compare the above specifications and equipment with cars selling from $500 to $1,000 more in price and see if you can find a better car than the Pilot.

Special Equipment

Westinghouse Air Springs May Be Had as Special Equipment on All Models

Dealers and Agents!

If you have sold cars that have given poor service, the Pilot will redeem your reputation. If you are selling good cars, your competitor with the Pilot will keep you awake nights with his competition, the Pilot having so many good points YOUR car does not possess. You will be on the defensive all the time, no matter what car you sell—even the very highest priced car. You will find your car will have to "step lively" to make even a showing with the **Pilot in Hill Climbing, Flexibility, General Road Work,** or any of the various and special tests which the shrewd car buyer requires to be performed satisfactorily before parting with his money.

Varnish No Longer Sells a Car

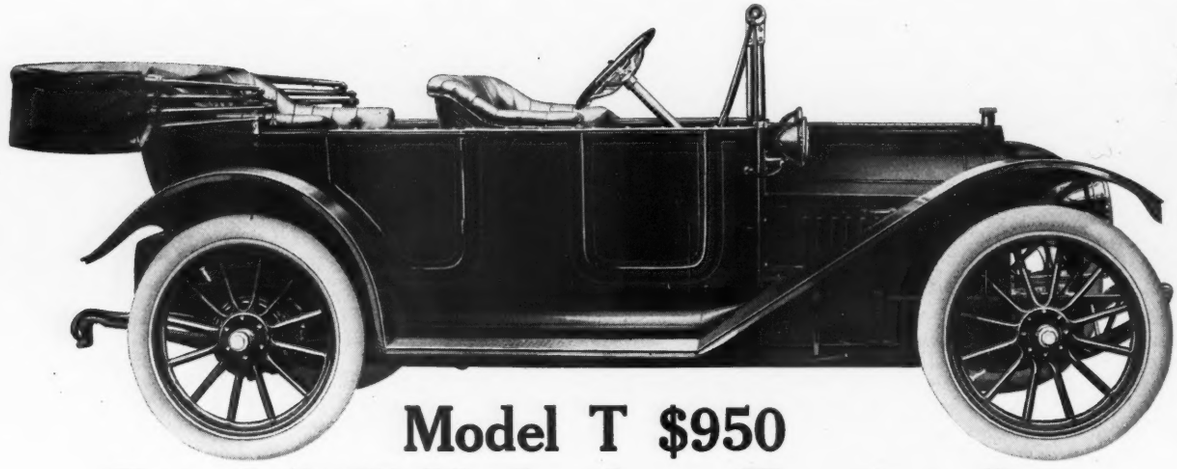
The wise car buyer looks under the body. He wants to know how strong are the **frame and axles** and what kind of **bearings** are used. He wants a dependable **clutch that takes hold gradually and will not slip** and the **transmission absolutely reliable** and the **gears** of the best alloy steel. He wants **twelve spokes** in the wheels and the spokes must be 1⅝-inch or more or no sale. He must have a **drive shaft at least 1½-inch in diameter and material chrome nickel steel.** He wants his machinery **accessible** so that adjustments can be easily effected when necessary and without great expense. You can satisfy him on every essential with a Pilot. She is built right. **No complicated machinery in a Pilot.** Adjustments are so easily made that any owner with but little mechanical knowledge can easily care for his car. And the equipment the **finest and most complete ever offered.** Everything needed on a car is there, including the famous Gray & Davis system for Lighting and Starting, the finest electric lighting and electric starting system yet devised, and the price—quality considered—the lowest in the land.

AGENTS WANTED (In Territory Not Taken)

Write us at once for the greatest agency proposition made by any manufacturer or distributor. **We co-operate** with you in your territory and do not require you to tie up a lot of money in deposits. If you have another car agency or desire an agency or are thinking of purchasing a car you cannot afford to neglect this opportunity of knowing more about the Pilot—**the car without a mechanical defect—but write at once for beautiful art book showing the Pilot models in colors and a complete and detailed description of the cars. Also get our agency offer for your territory. It will interest you.**

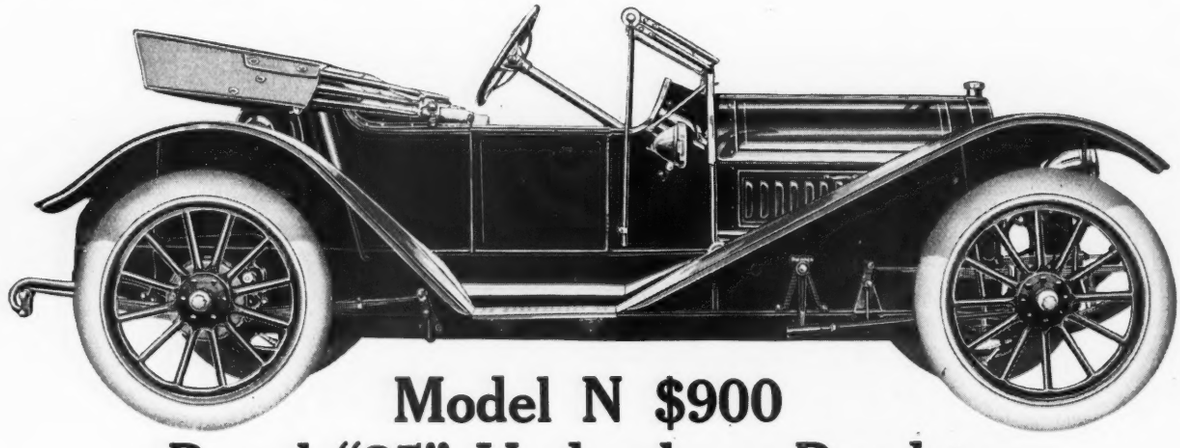
PILOT CAR SALES COMPANY, Richmond, Ind.

You Will Find Them at the Shows—and Everywhere



Model T $950
Regal "25" Underslung Touring Car

Tires Morgan & Wright, 32 x 3½ inches. Selective sliding gear transmission, three speed forward and reverse. Motor, four cylinders cast en bloc; bore, 3¾ inches; stroke, 4½ inches; dual ignition; thermo-syphon cooling. Equipment includes nickel plated trimmings, electric lights with option of gas headlights, oil side and tail lamps, and Prest-O-Lite tank; electric horn; foot accelerator; tools and tire repair kit. Top, wind shield and speedometer, $75 extra. Price $950.



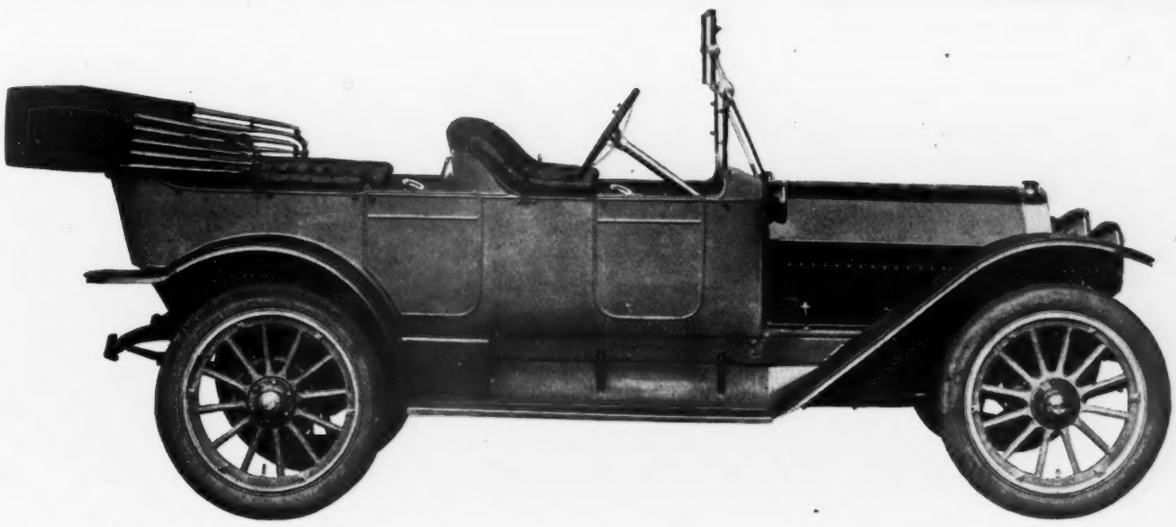
Model N $900
Regal "25" Underslung Roadster

Tires, Morgan & Wright, 32 x 3½ inches. Selective sliding gear transmission; three speeds forward and reverse. Motor, four cylinders, cast en bloc; bore, 3¾ inches; stroke, 4½ inches; dual ignition; thermo-syphon cooling. Equipment includes nickel-plated trimmings; electric lights, with option of gas headlights; oil side and tail lamps and Prest-O-Lite tank; electric horn; foot accelerator; tools and tire repair kit. Top, wind shield and speedometer, $75 extra. Price $900.

These popular Regal Cars and other Regal Models will be exhibited at the Grand Central Palace, New York Automobile Show, Space 27 — and at the First Regiment Armory, Chicago, Space E 3.

See them—hear the story of their success (43)

Regal Motor Car Co., Factories, Detroit, Mich.



The Westcott Six, $2,475

Electrically Started and Lighted
127-inch Wheel Base---5 Passenger

The Westcott Line for 1913 is a glowing tribute to the whole science of automobile building—

The Westcott Motor Car Company occupy their supreme position in automobile manufacturing because of their excellent selection of the vital parts that make up the splendid Westcott Six—

The component parts of the new Westcott Six are built in plants whose whole endeavor has been to secure perfection in their individual fields; and—

From the first, the Westcott Motor Car Company have turned their entire efforts to the joining of these separate units in one harmonious whole—

Westcott popularity is not due to the stimulation of public opinion through advertising—

The Westcott Line stands pre-eminent in a field of costlier cars because of actual performance and faithful service—

It is one of the few Six Cylinder Cars that possesses the tremendous "reserve power" so essential and so necessary to the success of the medium priced Six—

Because of the high favor in which the Westcott car is held by both the automobile trade and the buying public, it has been decided that the Westcott Line will be advertised extensively in 1913—

In advertising the Westcott Line we believe that we are rendering just as much service to the ultimate car buyer as we are to the dealers and ourselves—

The motor car buyer will no longer be compelled to buy the Westcott car on the favorable expressions of other Westcott car owners, however favorable they may be, but you have as their guarantee, and assurance of sincere service, the positive statements and claims made for Westcott superiority by the people who build it.

Westcott Motor Car Company, RICHMOND, INDIANA

Don't Miss the Big Chicago Show Issues

FORTY thousand motor owners and motor dealers are looking forward to the Chicago Show numbers of MOTOR AGE and THE AUTOMOBILE.

These show issues are part of the shows themselves—a compact digest of everything the industry has produced in the past year.

Forty thousand motor-wise readers will be extremely interested in the Chicago Show issues.

They will absorb them from cover to cover.

They will keep them and refer to them as they would to a directory.

WHAT THE EXPERT SEES

1. The famous Rutenber Motor with enclosed valves.
2. Remy high-tension Magneto.
3. Schebler Carburetor.
4. Flexible coupling between motor and transmission.
5. Large end thrust bearing back of disk.
6. Lambert Patented Friction Plate.
7. The Lambert removable friction Fibre.
8. Two brakes on each rear wheel.
9. The Renold Silent Chain is thoroughly enclosed in a quick removable dust tight metal case.
10. Flexible suspension of the jack-shaft which is mounted on gimbal bearings.
11. Full elliptic springs are just as necessary on an automobile for easy riding qualities as on a buggy.

Ninety Horse-Power Salesmen Not Needed

Popular-Priced Cars for Progressive Dealers

The ideal of motorists has ever been a gearless car, operating without noise, shock or jar.

In the **Lambert** this ideal has been reduced to an exact science, brought to practical perfection and then proved emphatically right in every form of service from pleasure cars to five-ton trucks.

Friction Drive has the advantages of economical operation,—requires practically no skill in manipulation and no injury to the parts is caused by sudden shocks upon the gearing, either as a result of careless handling or inequalities of the road. It appeals to the motorist's mechanical common sense and to the owner's pocketbook.

In addition, the **Lambert** combines all the best features of high-price gear drive cars such as the Rutenber Motor, Remy Magneto, Schebler Carburetor, I-beam front axle, Renolds Silent Chain, full elliptic springs, together with such features characteristic of **Lambert** construction as follows: flexible coupling between motor and transmission, large end thrust bearing back of disk, **Lambert** patented friction plate, automatic release of brakes when transmission is engaged,—yet at prices that meet the popular demand.

These facts make the **Lambert** 1913 car a most attractive proposition to the sales agent and enables him to make two sales as easily as one can be made with a geardrive car at the same price.

Two-Passenger Model 99 Roadster

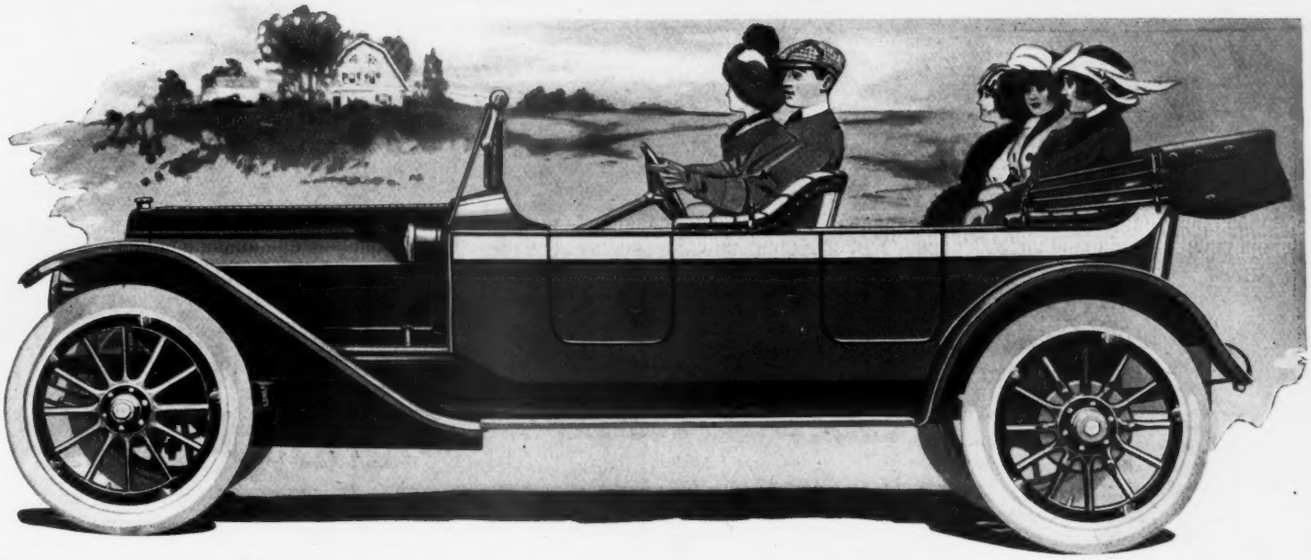
Prices range from $800—$1450

A 106-PAGE CATALOG UPON REQUEST

The Buckeye Manufacturing Co.

1802-1822 Columbus Avenue, Anderson, Indiana

Your Motor Car!



Center Control
Electric Starter
Electric Lights
Electric Horn

Nyberg SIX
$2000

YOUR MOTOR CAR is a stylish, comfortable SIX—a car which any man may well be proud to own. A valuable addition to any dealer's line.

The demand is for SIXES. You cannot meet it with anything but SIXES.

A man who wants a SIX will not have a four, at least not without a lot of effort on your part.

Why put in all this overtime trying to sell him what he doesn't want.

When he sees this ad or any other Nyberg advertising headed "Your Motor Car," he is going to take a look.

If he reads the specifications he will investigate the car.

If he investigates the car, it will mean an easy sale for someone.

Why not investigate the Nyberg Line Yourself?

Here is a change to secure the agency for a proven SIX—one which is entering its third successful season.

The dealer who handles the Nyberg SIXES in 1913 will be prepared to take care of the greater demand which is bound to come in 1914.

Let us send you literature illustrating and describing the entire line—or, better still, come to our factory and see "Your Motor Car."

There will be a shortage of SIXES in 1913.

Many SIXES have been tried—few have been proven successful.

Before the end of the 1913 season, there will be a shortage of SIXES of all kinds, especially the medium-priced cars.

We have changed our production schedule so that we will build five hundred more SIXES than originally planned.

These will take care of a few dealers in unoccupied territory, but they will not meet the demand.

The dealer who gets his specifications in early will reap the benefit when the big selling season opens next spring.

Look over the field. Where can you get the agency for a proven SIX selling for less than $2500.00? There are mighty few successful sixes in the market at any price. Most of them are experiments.

The Nyberg SIX has been a success for two seasons. With the exception of minor changes and refinements, it will be the same, stylish, powerful, dependable SIX in 1913.

If you haven't a low-priced SIX in your line for next season, investigate the Nyberg. Your time will be well spent and you will be fortifying yourself for 1914.

Nyberg Six	Two Passenger Roadster	$1950.00
	Five Passenger Touring Car	$2000.00
	Five Passenger Tourabout	$2000.00
	Seven Passenger Touring Car	$2100.00
Nyberg Four	Four-40 Roadster	$1400.00
	Four-40 Five Passenger	$1450.00
	Four-37 Roadster	$1285.00
	Four-37 Five passenger	$1295.00

NYBERG AUTOMOBILE WORKS

Northern Factory: Anderson, Indiana — Chicago Branch: 2437-2439 Michigan Ave. — Southern Factory: Chattanooga, Tenn.

The Car that *Survives*

GLIDE "36-42" FEATURES

Automatic Dynamo Lighting System

Motor-driven Tire Pump

Unit Power Plant

Long Stroke Motor with *Enclosed Valves*

Center Control

Left Side Drive

Electric Side Lamps in Dash

Electric Headlights and Tail Lamp

An *Efficient* Self-Starter

Floating Rear Axle with Pressed Steel Housing

118-inch Wheel Base

Demountable Rims (Baker bolted-on)

Goodyear No-Rim-Cut Tires

Glide

THE GLIDE is the car that survives hard use — survives comparison—survives the years.

The GLIDE is a *pleasure* car—not a worry wagon. Its great, powerful, silent, smooth-running, long-stroke motor seems to do its work with astonishing ease.

No Car Is Better

because a better car is impossible.

The new GLIDE **Motor-Driven Tire Pump** saves your strength, your time, your temper. Also *saves your tires* by keeping them *fully inflated* at all times without any wearisome effort upon your part.

The Electric Lighting System is another of the GLIDE'S high-class features. Simply touch a button and your five lamps are all "on watch."

Electric Bull's Eye Side Lamps are *sunk in dash*, adding to the GLIDE'S appearance, eliminating all rattling and minimizing chances for breakage.

The GLIDE Self-Starter is *sure* of a spark, regardless of whether the points of the magneto are together or not, as the GLIDE has a hand make-and-break on the dash.

No other car gives you the up-to-date, efficient, luxurious GLIDE equipment, together with GLIDE structural quality and GLIDE service at *anywhere near* the GLIDE price! This means money actually *saved* for *you*.

Write NOW for detailed descriptive circular.

Dealers

A GLIDE agency will be worth thousands of dollars to you. Open territory can be obtained NOW upon very attractive terms. Don't let this exceptional opportunity slip through your fingers. If you do, you'll regret it. Write us TODAY.

THE BARTHOLOMEW CO., 215 Glide Street, Peoria, Illinois

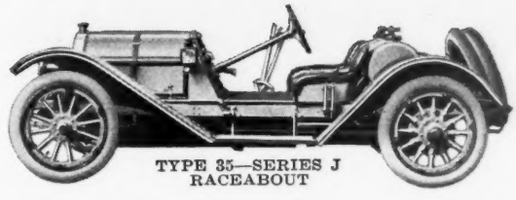
GLIDE "36-42" in 2 and 5-Passenger Bodies

$1690
Fully Equipped

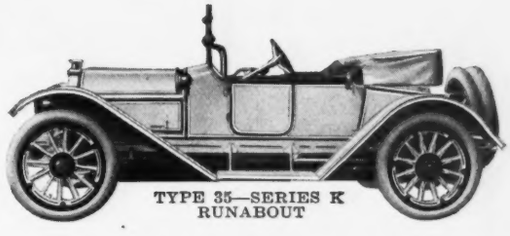
The GLIDE Line also includes the "45-50" in 2, 4, 5 and 7-passenger styles, Delivery Cars, Police Patrol and Ambulance.

MERCER

CHAMPION LIGHT CAR OF AMERICA

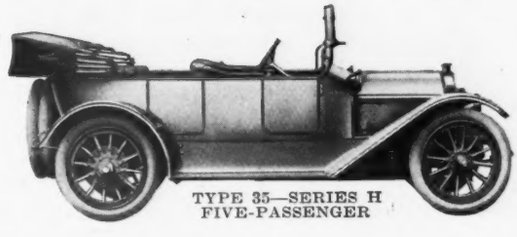


TYPE 35—SERIES J
RACEABOUT



TYPE 35—SERIES K
RUNABOUT

High Efficiency Motor.
Perfect Lubricating System.
Reliable Steering Gear.
Large and perfectly balanced crankshaft.
Four speed Transmission.
Foot brake operating on Transmission.



TYPE 35—SERIES H
FIVE-PASSENGER

Springs that give real riding comfort.
Two-spark Bosch Magneto of enclosed Type.
Perfected electric lighting and starting systems, both separate units and operating independently of Ignition.
Distinctive and exclusive body designs.

Mercer power and efficiency are well-known qualities. These features are decidedly emphasized in our new series. The various models offer a Mercer for every reasonable need.

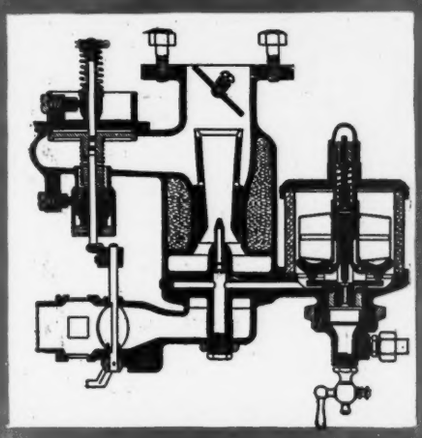
Prices: $2600 to $2900

DESCRIPTIVE LITERATURE SENT ON REQUEST.

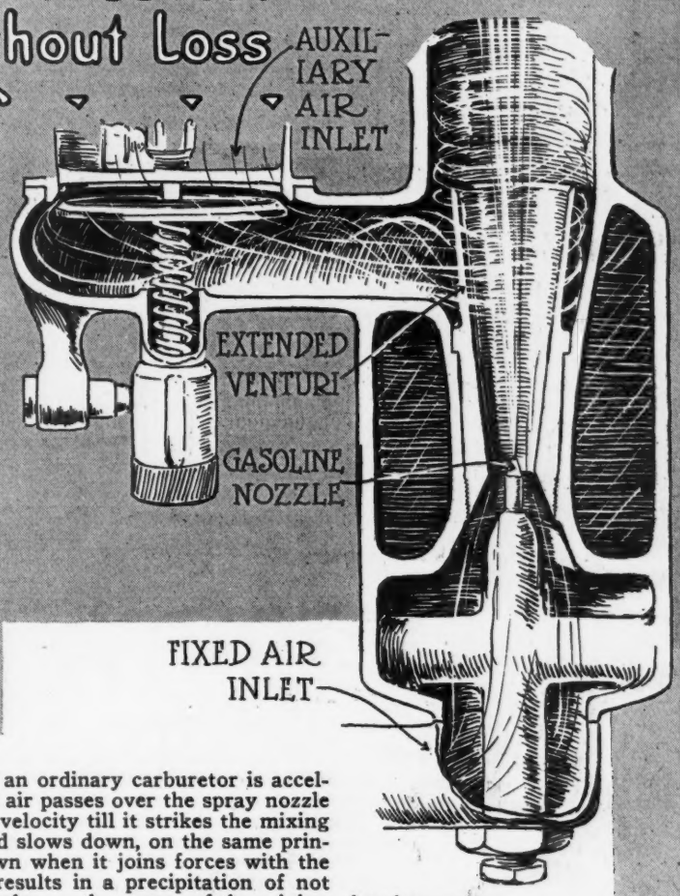
Mercer Automobile Company, 800 Whitehead Road, Trenton, N. J.

WHY STROMBERG

Carburetors Give Greatest Acceleration Without Loss in Economy



SECTIONAL VIEW- MODEL A



When the motor equipped with an ordinary carburetor is accelerated, what happens? The regular air passes over the spray nozzle at high velocity. It maintains this velocity till it strikes the mixing chamber, where it broadens out and slows down, on the same principle a mountain torrent slows down when it joins forces with the sea. This slackening in velocity results in a precipitation of not thoroughly vaporized gasoline globules on the curves of the mixing chamber walls.

The auxiliary air drawn upon results in a further hammering-down of the regular air, trying to force its way to the manifold. It drives directly across the path of the regular air—joins it in a "raw" state—makes for a disproportionate mixture. And a disproportionate mixture kills good acceleration.

The gasoline precipitated on the walls of the mixing chamber gathers and runs away—wasted. Or on a sudden opening of the throttle it is sucked up in "bunches" to the motor, where it causes "loading" and "black smoke."

None of the above applies to STROMBERG *Improved* Carburetors. Upon acceleration the regular air passes over the spray nozzle at a velocity determined at the factory just right. Because of the extended venturi (see diagram) it loses none of its "drive" by broadening out when it enters the mixing chamber. The extended venturi reaches as near as possible to the throttle opening, whence the mixture is drawn to the motor, without precipitation of one globule of gasoline. Gasoline globules are not given time to deposit.

Furthermore, it is mechanically impossible for the auxiliary air in a STROMBERG to "buck" the regular air. The auxiliary air strikes the extended venturi, whirls around it, is cyclonic in effect. It helps the regular air, and at the same time becomes thoroughly saturated with gas. The result is a just-right mixture for acceleration at any speed—accomplished by use of the *slimmest* amount of fuel consistent to such a mixture. These are "Reasons Why" STROMBERG *Improved* Carburetors give greatest acceleration without loss in economy. Next week will appear "WHY STROMBERG IMPROVED CARBURETORS THROTTLE DOWN TO LOWEST SPEED ON HIGH GEAR, YET PERSISTENTLY MAINTAIN GOOD ECONOMY."

"Reason Why" Talk—3

Look for our exhibit at the New York Show (Madison Square Garden Balcony space 210), and at Chicago

Stromberg Motor Devices Company, 100 East 25th St., Chicago, Ill.

Branches: New York Boston San Francisco Indianapolis Minneapolis Detroit

Resiliency without Repair Bills

It's in the spokes

"No chain is stronger than its weakest link," and no motor-driven vehicle is more dependable than its least perfect part—usually the tires. Your car may be built with scientific skill, designed to develop marvelous power, finished with fastidious care and supplied with every appointment that luxury can suggest—yet it must travel at last on four bags of wind—at the mercy of every broken bottle and every stray horse-shoe nail—*UNLESS* you equip it with some more dependable source of shock absorption and free yourself from dependence on rubber tubes filled with compressed air. The

IDEAL STEEL RESILIENT WHEEL

fitted with airless or solid rubber tires solves the tire problem and makes the automobile a dependable utility altogether independent of the tires. It provides greater ease in riding than has ever before been attained in motor car construction. It enables you to enjoy peace of mind—free from the ever present dread of the puncture or blow-out that will summon you to an immediate stop regardless of place, time or weather. It gives greater comfort in body and mind to you, more protection to the chassis of your car, increased traction power, 100% increase in the life of the tires. And all this in addition to complete immunity from tire repair bills.

The Ideal Resilient Steel Wheel is constructed on the same principle as the elliptical steel spring suspension now universally adopted for bodies.

There are ten spokes, each composed of two segments of chrome vanadium steel and bent to the exact degree required to assure maximum resiliency and strength.

These segments can be inserted without jacking up the car. This wheel is instantly demountable and it can be slipped on over the spindle by the removal of the dust cap. An inexperienced person can make the change in three minutes and a skilled operator can accomplish it in less than a minute.

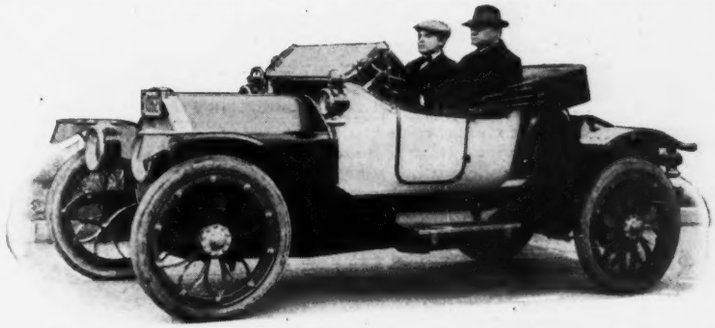
The resiliency of these wheels when equipped with airless or solid rubber tires is greater than that of wood wheels with pneumatic tires at their best. They cushion the entire car against the shocks of the road way, reducing the strain on the suspension. Laterally, they are by actual test several times stronger than a wooden wheel. They furnish torsional strength and elasticity such as to insure the minimum strain on the motor and transmission when the clutch is engaged and to increase the efficiency of the brakes while reducing the violence of their action when suddenly applied.

Ideal Resilient Wheels are **guaranteed to double the life of any style of tires** and to pay for themselves out of the increased service from the first set of tires.

Our 7 passenger demonstrating car fitted with Ideal Resilient Steel Wheels and airless tires has traveled over 14,000 miles without one cent expended for tire repairs.

These wheels can be furnished to meet the requirements of all motor-driven vehicles from motorcycles to trucks. They are indispensable for electrics, ladies' vehicles and pleasure cars.

If your supply man does not handle them write to us, stating make and model of your car and its capacity, and mention the name of your dealer.



Roadster equipped with Ideal Resilient Steel Wheels and Airless Tires

Write for literature today

The Ideal Steel Wheel Company

1069 First National Bank Building **Cincinnati, Ohio**

Model B
$50

IT'S KNOWN BY ITS 4 BIG FEATURES

Our magnificent new 1913 instrument is an example of highest development in the construction of a

Magnetic Speedometer

The magnetic principle is the only scientific principle of speedometer construction. It is—by far—the most costly construction. The magnetic principle—alone—permits the use of a frictionless indicating means and of low speed, non-vibrating drive.

THE NEW 1913
Stewart Speedometer
Has Four Splendid Features

The New 1913 Stewart Speedometer has the new "reversed" revolving Speed Dial with Zero Stop mounted on full jeweled bearings and operated by Tungsten steel magnet, Stewart "closed ring" type. Steady and accurate at all speeds. Read at a glance

We Threw It Away!

Our Old Centrifugal Type Speedometer

The first speedometer we made was of the centrifugal type—but long ago we cast it upon the scrap heap of the obsolete—

—because the governor of a centrifugal instrument must revolve at a high speed of over ***two thousand five hundred revolutions*** to the mile, causing vibration and bearing friction that no instrument can stand.

—because the centrifugal type ***will not indicate*** any speed under 7 miles an hour!

—because continued accuracy with a centrifugal type of speedometer is utterly impossible. It is necessary to multiply the movement of the indicating means ***sixteen times*** in order to get a movement of the pointer hand sufficient to permit the use of a scale large enough to be readable. ***Therefore, any error in accuracy is multiplied sixteen times!***

—because our new and perfected type of MAGNETIC speedometer has rendered all types of centrifugal speedometers crude and obsolete!

It has a big, sturdy 100,000-mile Season Register, operated by "direct drive" gears and controlled by "Geneva Stop" mechanism.

It has a 100-mile Trip Register that can be rapidly reset to any tenth of a mile and without disturbing the record of the Season Register. This is an excellent feature for motorists when following instructions of route book while touring.

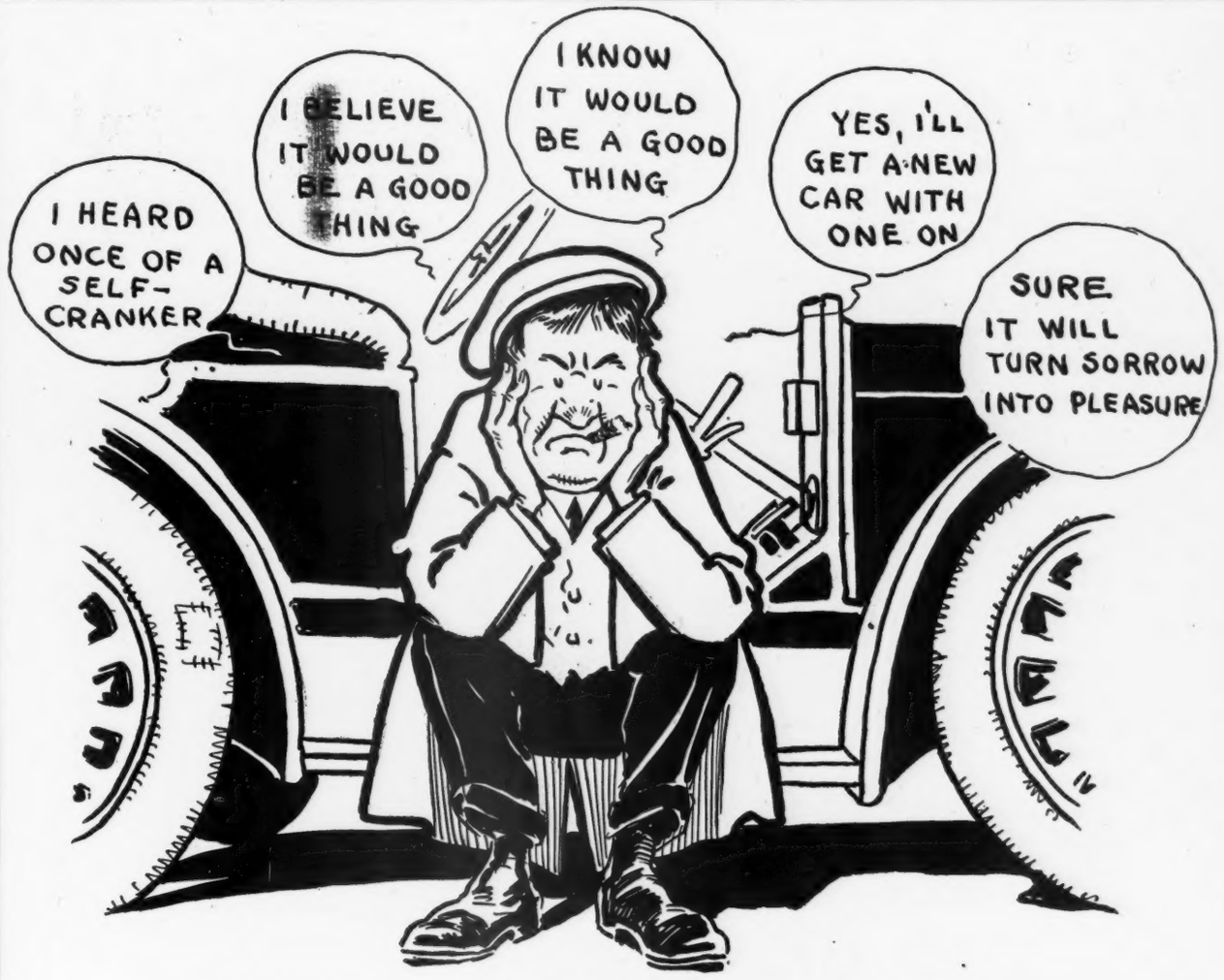
It has the Grade Indicator with revolving dial mounted on polished bearings and operated by gravity. Shows the various percentages of grades from zero up to 30 degrees.

IF YOU DESIRE PERMANENT SATISFACTION SEE THAT THE MAGNIFICENT NEW 1913 STEWART SPEEDOMETER IS INSTALLED ON THE CAR YOU BUY

Stewart-Warner Speedometer Corporation

Factories at Chicago and Beloit
General Offices: 1931 Diversey Blvd., Chicago

New York, Philadelphia, Denver, Los Angeles, Indianapolis, Pittsburgh, Chicago, Cleveland, Portland, Minneapolis, Boston, Seattle, Kansas City, St. Louis, Toronto, San Francisco, Atlanta, Buffalo, London, Detroit, Cincinnati, Paris



ALL IN, DOWN AND OUT

How often, after cranking your head off, without getting your car started, have you felt like this gentleman? Oh yes, he **was** a gentleman a short time ago, but he doesn't look like one now, we'll admit.

See That Your 1913 Car Has an Electric Cranker

and you can always **look** like a gentleman whether you are or not. But be sure, for efficient, long-lived service, that your electric equipment is operated from an

GLBA

STORAGE BATTERY

Use Class A GLBA Battery with an Electric Lighting Generator
Use Class B GLBA Battery with an Electric Self-Starter

Write us for full information

Willard Storage Battery Co.

CLEVELAND, OHIO

New York Branch: 136 W. 52d St.
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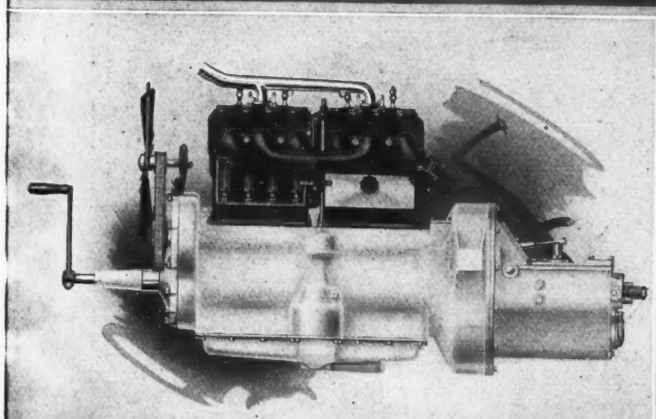
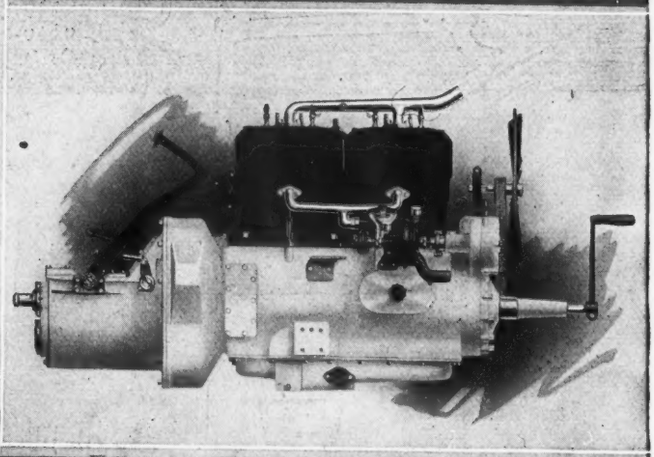
Chicago Branch: 2241 Michigan Ave.
San Francisco Branch: 243 Monadnock Bldg.

Depots in all Principal Cities in the United States, Canada and Mexico

ERGON MOTORS





Introducing a New Motor

AS the name implies, Ergon Motors are "work" motors—motors literally filled with work and energy. Ergon Motors are the result of a definite intention to keep pace with the growth and demand of the motor car industry—both in its pleasure and commercial branches.

This new motor, which is larger than any of our previous products, is of the four-cylinder, four-cycle "L" head type, with cylinders cast in pairs. It is a long stroke motor, the length of stroke being 6 inches, with a bore of 4⅜ inches. Next to power, accessibility and simplicity have been the prime considerations in the construction of Ergon Motors.

It is the intention herewith to announce generally the production of these new motors rather than to specifically go into the construction details. However, we wish to emphasize the fact that wherever we have had recourse to parts or materials produced out of our own factory we have acquired only the acknowledged best. For instance, all of our bearings are either F. & S. or Timken. The crank shafts and connecting rods are made by the Driggs-Seabury Ordnance Corporation, of Sharon, Pa. The silent chain drives are made by Hans Renold, of Manchester, England. The design of Ergon Motors is such as to accommodate several standard makes of either electric or pneumatic starters.

HAZARD MOTOR MANUFACTURING COMPANY
ROCHESTER, NEW YORK

Champion Priming Plugs

Start Any Motor — In Any Kind of Weather

No matter how cold your car's cylinders,

Champion Priming Plugs

will start your motor on the first quarter turn

Open needle valves slightly (you needn't remove glove) and inject gasoline. Passing through its own channel to plug base. It vaporizes directly at spark point.

You must prime your motor in the winter—there's no alternative.

Cold chills the gasoline; it won't expand upward.

You can't send the best possible spark down far enough to fire it.

Present low test gasoline makes the problem still harder.

Champion Priming Plugs produce a rich mixture **right at the firing points**—then shoot a hot, sizzling spark right into it.

You can't get the same results with priming cups; they can't be placed close enough to the spark plug.

The Champion Priming Plug combines a perfect prime-r and a perfect spark plug.

And it won't "soot up" or leak compression.

Champion Spark Plugs are regular equipment on nearly 70% of the American cars today.

You can trust the good judgment that demands them for all the Fords, Overlands, Michigans, etc., etc.

The illustration shows the simplicity of the **Champion Priming Plug.** It is guaranteed to work perfectly **or your money back.**

For Sale Everywhere at $1.25 per Plug

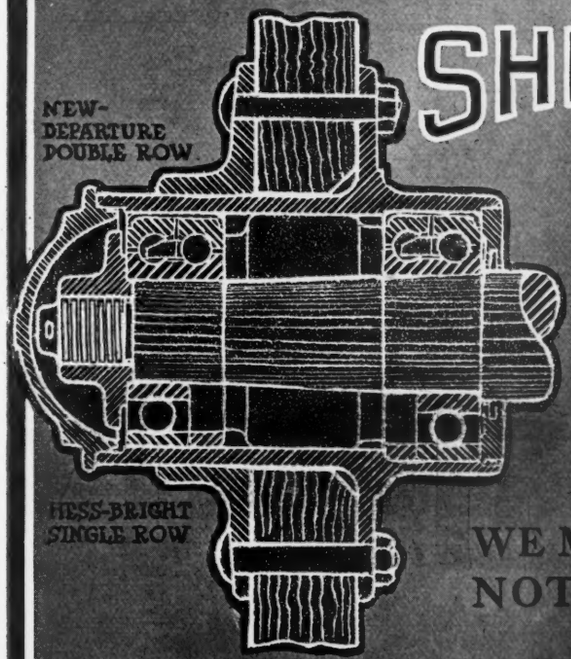
Trial Set of Four Champion Priming Plugs, fully guaranteed, prepaid to any car owner for $5. Give name of car and year of make—also name of your dealer.

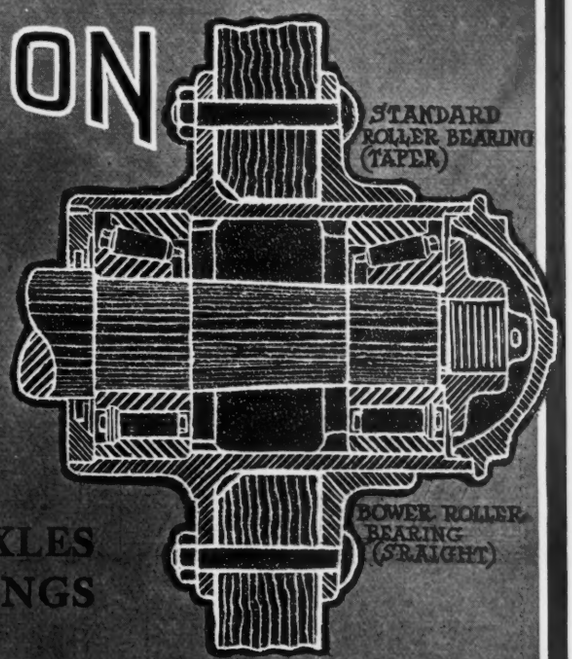
All jobbers and most dealers are already supplied. Write today. Liberal trade discount to dealers. Be ready to supply your trade while our big campaign is calling the attention of car owners everywhere to these priming plugs.

CHAMPION SPARK PLUG COMPANY
104 Upton Avenue **Toledo, Ohio**

CHAMPION
TRADE-MARK

SHELDON





WE MAKE AXLES NOT BEARINGS

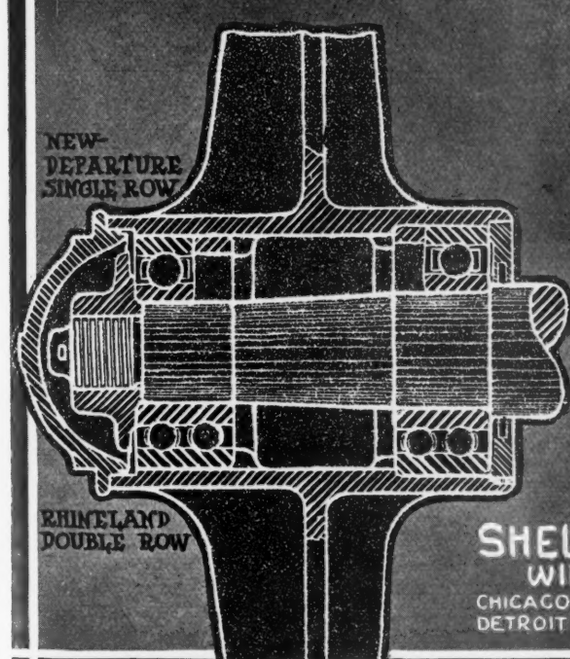
Manufacturers purchasing Sheldon Axles to-day, are offered a completeness of equipment which exceeds anything previously known to the motoring industry.

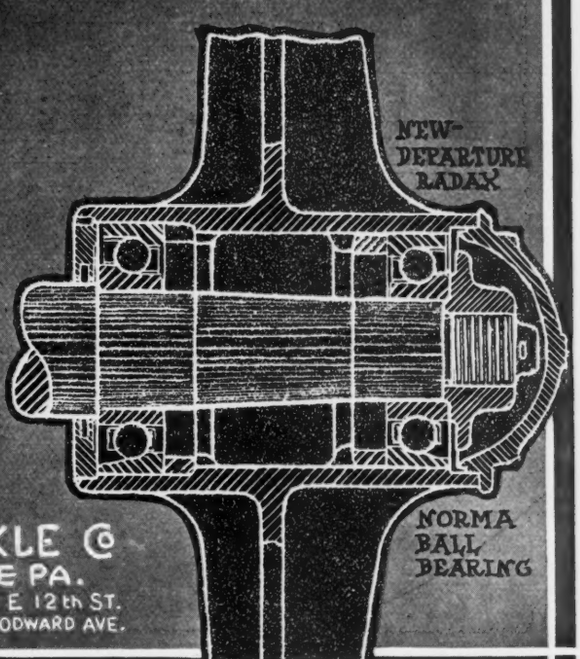
Our new axles are equipped for wooden or steel wheels with your choice of the following high class bearings:

New Departure Double Row
Hess-Bright Single Row
Standard Taper Roller Bearing
Bower Roller Bearing (straight)
New Departure Single Row
Rhineland Double Row
New Departure Radax and Norma Ball Bearings

We do not offer our axles as a means of selling bearings because we are distinctly axle manufacturers. We offer car makers their choice of all the best bearings that can be made—domestic or foreign—simply that the rest of the equipment may conform to Sheldon superiority.

Surely no car equipped with Sheldon Axles and a choice of any of the bearings mentioned on this page will be lacking in quality.





SHELDON AXLE Co
WILKES-BARRE PA.
CHICAGO BRANCH: 68 E 12th ST.
DETROIT BRANCH: 1215 WOODWARD AVE.

KINGSTON

IGNITION SPECIALTIES

There are three ways you can find out about KINGSTON Magnetos. One way is to read about them; another is to have somebody tell you about their good features—but the best way is to try them yourself; then you will know positively that KINGSTON Ignition is instantaneous, constant and reliable.

KINGSTON Magnetos are made in different types for all kinds of purposes—for high or low tension currents—for low or heavy duty. They have accomplished more towards simplifying and solving the whole ignition problem than all other magnetos combined. You will give evidence of your motor-wisdom by seeing that your 1913 car carries a KINGSTON.

KINGSTON Ignition Specialties include spark plugs, make-and-break coils, dash coils, box coils, motor cycle coils and other ignition devices, every one of which is guaranteed to give perfect satisfaction.

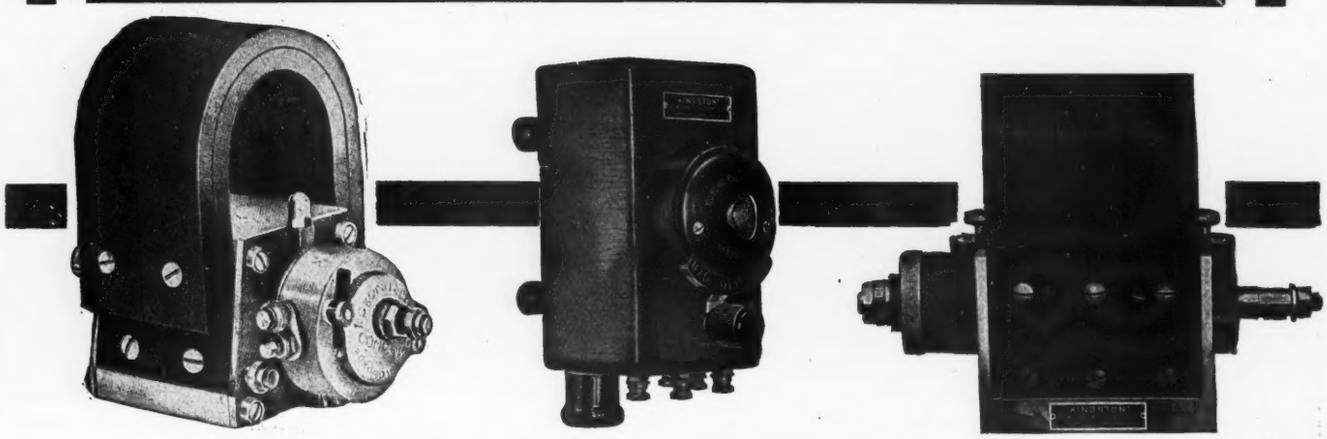
Write for Catalog

See our exhibit at the New York Show, Madison Square Garden, elevated platform, Space 173, and at the Chicago Show, Coliseum, Balcony, Space 78.

Kokomo Electric Company, Kokomo, Indiana

BRANCHES

CHICAGO.....1430 Michigan Ave.
NEW YORK.....1733 Broadway
DETROIT.....650 Woodward Ave.
LOS ANGELES.....804 So. Olive St.



PATENTED

Get All the Power *In* Your Motor *Out* of it with Leak-Proof Piston Rings

LEAK-PROOF PISTON RINGS insure *perfect compression*—make compression leakage a *mechanical impossibility.* Perfect compression means *maximum* motor power—means that every particle of gas in your cylinders will aid in transmitting the motor's *full* horse-power capacity to the drive-shaft. No power *can* be wasted.

LEAK-PROOF PISTON RINGS make every drop of gasoline *count*—make it do the work intended for it. That is why LEAK-PROOF RINGS make for *maximum fuel economy.*

LEAK-PROOF RINGS *decrease carbonization.* They keep back oil which might otherwise get into the cylinders. They absolutely prevent "black smoke," "trailing," and a host of other motor ills.

Do you realize that you are paying more *right along* using *ordinary* piston rings than it would cost you to purchase LEAK-PROOF RINGS *once?*

LEAK-PROOF RINGS are made in all sizes for all requirements. They may be obtained from any supply house, garage or repair shop, or from our nearest branch office.

DEALERS! Here is a *necessity* that every motorist *wants.* 900,000 motorists in the United States *demand* maximum power from their motors. Here is *your* opportunity to give it to them. Write us for sales proposition.

"ASK THE USER."

McQUAY-NORRIS MFG. COMPANY, 1312 Chestnut Street, St. Louis, Mo.

Branch Offices and Managers:

NEW YORK, N. Y.....H. P. Marsh, 625 Lenox Ave.
CHICAGO, ILLS.....H. G. Paro, Suite 39, Merchants' Bldg., 106 N. La Salle Street.
PITTSBURGH, PA.....J. W. McKeen, 7620 Tioga Street
SAN FRANCISCO, CALIF...Wm. B. Godfrey, 268 Market Street
KANSAS CITY, MO....Chas. H. Eckhard, 3123 Michigan Avenue
LOS ANGELES, CALIF.....W. H. Steele, 822 Central Bldg., 6th & Main Streets.
FORT WORTH, TEXAS.....E. S. Moberly, 108 Bryan Street

The Atwater Kent Ignition System

has been silently advertised from coast to coast by the best advereisement any product can have—the personal endorsement of over 100,000 satisfied motorists.

During the period of the magneto craze, we could have taken advantage of this fad and manufactured magnetos. Due to our facilities and prestige, we could undoubtedly have produced and sold large quantities of them. We knew, however, that the Atwater Kent System was fundamentally correct in principle and that it was better than any other ignition device. This opinion was also shared by thousands of our friends who discarded the magnetos on their new cars and installed the Atwater Kent, claiming they got much better results with much less trouble.

You can't equip your car with a more reliable ignition system than the Atwater Kent—no matter what amount of money you are willing or expect to pay for it. Why then take chances by investing in other equipment when by installing the Atwater Kent System you close every avenue to future regret?

Just a few of the many good features of the Atwater Kent System and its advantages over the magneto:

The spark is of constant heat quality irrespective of the speed of the engine, thereby enabling the engine to be run at a very much lower speed if desired.

The simplicity and accessibility of the different parts of the Uni-Sparker are much greater than in the case of the magneto.

The adjustment of the platinum contacts does not affect the timing of the spark.

Easy adjustment to lengthen or shorten the spark, thereby insuring the maximum economy of battery current.

Low maintenance cost and repair expense. Will start engine on spark. Duplicate ignition system not necessary. Light weight. No magnets to become demagnetized. Unlimited range of spark advance or retard. Low initial cost.

In connection with the standard Type F System, we are furnishing a new model—Silent Type K with automatic spark advance and insulated primary circuit, especially designed for use in connection with lighting and starting equipment.

PRICES OF THE TYPE F SYSTEM

	Standard Coil	Kick Switch Coil
1-cylinder	$17.00	
2-cylinder opposed	18.00	
2-cylinder distributor type	22.00	$24.00
3-cylinder distributor type	25.00	27.00
4-cylinder distributor type	25.00	27.00
6-cylinder distributor type	27.00	29.00

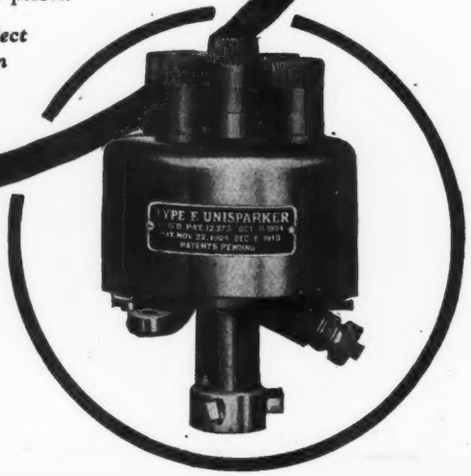
PRICES OF THE TYPE K SYSTEM

	Standard Coil	Kick Switch Coil
2-cylinder	$32.00	$35.00
3-cylinder	35.00	38.00
4-cylinder	35.00	38.00
6-cylinder	37.00	40.00

If you have an unsatisfactory magneto, or if your engine has no timer shaft, you can use the Atwater Kent System by means of a special "magneto gear mounting," the cost of which is $5.00 in addition to the above prices.

Possibly all that car of yours needs to give perfect service is an Atwater Kent Ignition System Our booklet, "A," is as interesting as it's free—yours for the asking.

See our Exhibits
Space 140 Madison Square New York
Space 8, Coliseum, Chicago



1508

ATWATER KENT MFG. WORKS

4934 Stenton Avenue, Philadelphia

If You Can Safeguard Your Car—Your Life

By Using

TRADE MARK **Raybestos** REG. U.S. PAT. OFF.

"THE ORIGINAL AND BEST ASBESTOS BRAKE LINING"

Why Accept Inferior Imitations of RAYBESTOS —Cheap Substitutes That May Fail in an Emergency?

We can't make this too strong—***nothing*** is so all-important as efficient brake lining—likewise nothing is so all-important as RAYBESTOS. Consider the accidents, the lives lost, the trouble due to faulty brakes. You wouldn't put your faith in "quack" medicines if your life was in the balance. Then why consider inferior brake lining?

On the hills, in traffic, at the crossing, your life and the lives of the occupants of your car are dependent upon the brakes. Don't take chances—don't flirt with danger. Demand RAYBESTOS lining as part-equipment on your car. If you need new lining tell your dealer or garage man to sell you RAYBESTOS.

Make That Car of Yours a Safe Car

See The ROYAL EQUIPMENT CO. Exhibit At the Automobile Show

Get acquainted with the ***best*** lining the automobile industry produces

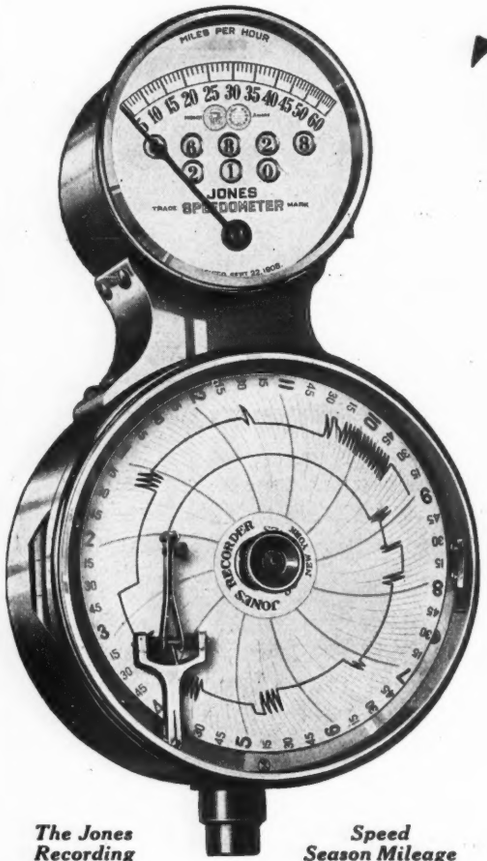
THE ROYAL EQUIPMENT CO.

438 Housatonic Ave., Bridgeport, Conn.

We also make Duplex and Raymond Brakes and Gyrex, the Mixer

Jones Sp

The Compl
Jones Spe



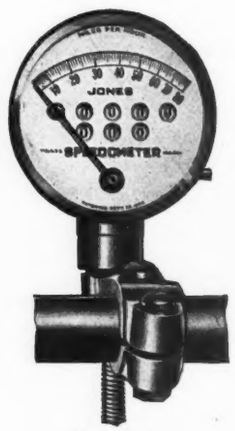
The Jones Recording Speedometer Model 34-39 $100.00

Speed
Season Mileage
Trip Mileage
Time
Record of above

Will be privately exhibited during Show Week at the Prince George Hotel, 27th Street between Madison and Fifth Ave., as we have been unable to secure adequate space at the Madison Square Garden.

Any dealer in automobile supplies will be glad to show you his complete line of Jones Speedometers.

The Speedometer by which the value of all others is measured.

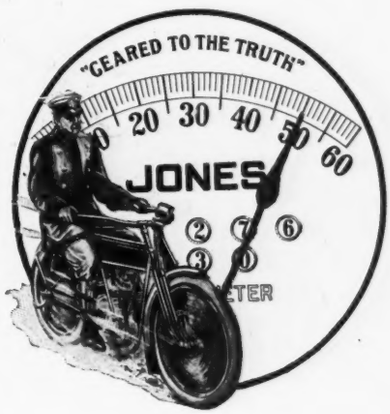


Model 831
$20.00

Model 34
$20.00

eedometer

ete Line of edometers



THE JONES — Centrifugal — SPEEDOMETER employing the same principle as the steam engine governor, is not affected by changes of temperature, or by the powerful, magnetic influence of the electric system of lighting and starting now so generally used.

THE JONES SPEEDOMETER

Bush Terminal, Brooklyn, New York
Broadway and 76th St., New York City

Model 29
$25.00

Model 40
$50.00

Model 316
$105.00

"Auto-Lite" Electric Starter

Manufacturers

Dealers

Car Owners

WE would greatly appreciate an opportunity to explain to you the details of our "Auto-Lite" electric starter and lighting system at our booth, No. 309-B, Concert Hall, Madison Square Garden, the week of the Pleasure Car Show, January 11th to 18th. We are positive it would be to our mutual advantage.

THE ELECTRIC AUTO-LITE COMPANY

MAIN OFFICE AND FACTORY, TOLEDO, OHIO

Branch Offices: **New York** **Kansas City** **San Francisco**

Swinehart TIRES

Show You How to Save Over 30% of Your Tire Cost

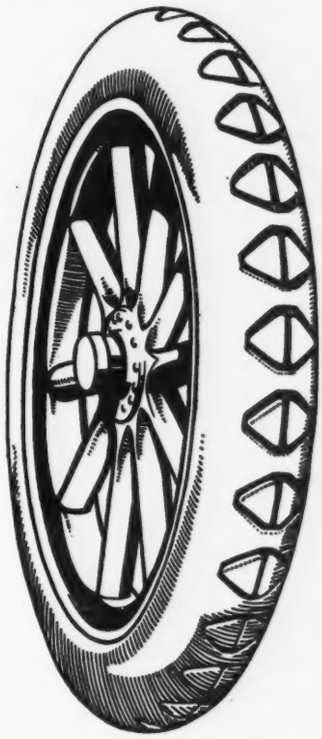
Swinehart Smooth Tread Tires, made by wrapped tread, two cure process, the most approved method.

In Clincher, Q. D. Clincher and Straight Side Types.

They are made of the best materials throughout, which an examination will show, and a test will prove.

This Non-Skid tire (Depression Type) is one that actually makes skidding **impossible.** The real skidless tire.

This, then, saves the cost of chains, which average 20 per cent of the cost of a casing — in addition to eliminating the chafing and tearing away of 20 per cent of the life of the casing.



All made by the two cure wrapped tread process—the most approved method.

Types—Clincher, Q. D. Clincher, Straight Side.

A Total Saving Averaging From 30% to 50%

Thousands in use. Approved and adopted on cabs of seven leading taxicab companies in New York City.

They never skid and they never wear chains.

Four times more wearing surface than any other non-skid. No buttons or projections to cause fabric trouble and their non-skid efficiency is good for two to three thousand miles, two to three times more than you get from others.

It pays to use NON-SKIDS,—GOOD NON-SKID TIRES. SWINEHART NON-SKIDS

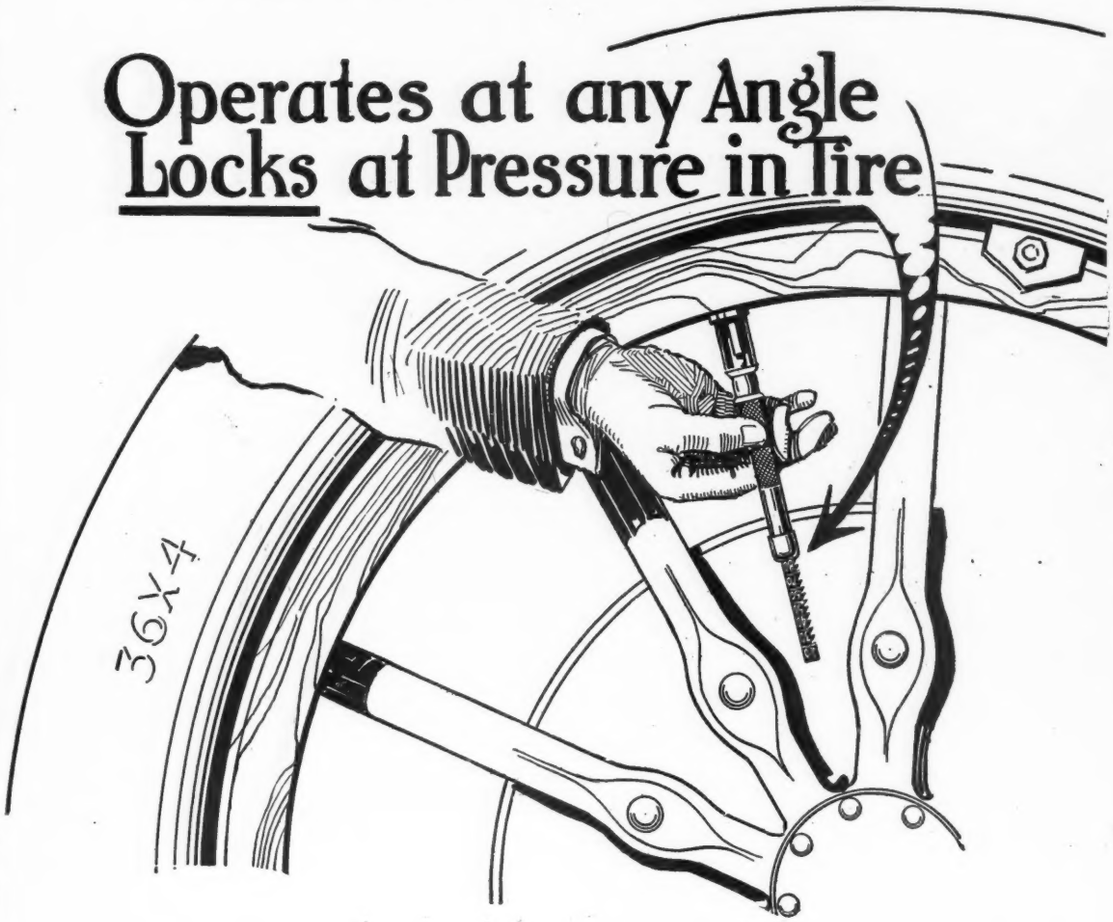
Exhibit, Elevated Platform, Space 170, Madison Square Garden

THE SWINEHART TIRE & RUBBER COMPANY, AKRON, OHIO

CHICAGO	1720 Michigan Avenue	NEW YORK	1924 Broadway
PHILADELPHIA	320 North Broad Street	BOSTON	727 Boylston Street
DETROIT	286 Jefferson Ave.	ATLANTA	11 Houston St.
KANSAS CITY	1813 Grand Ave.		

The New Positive Lock Stop Twitchell Air Gauge

Operates at any Angle Locks at Pressure in Tire



Tire Insurance for $1.00

THE NEW TWITCHELL is the most accurate, simplest, most durable and most easily applied and read tire gauge made. It can be used with the tire valve at any angle and positively locks at pressure in tire—two essentials for a first class tire gauge which are exclusive Twitchell features. With a Twitchell gauge you don't have to pull the wheel around until the valve is at the bottom of the wheel. The ratchet makes it possible to get an accurate reading with the valve at any angle. The indicator bar is held not merely by friction, but positively locks at the pressure in the tire and remains there until released by pressure on the end of the bar. That means that you can be sure of an accurate reading even when you are obliged to carry the gauge to the headlight at night.

With aid of a Twitchell you can always keep your tires inflated to proper riding pressure and not only lengthen the life of your tires, but avoid 75 per cent of your tire troubles. Yes, 75 per cent, for that is the proportion of tire troubles that are directly due to improper inflation.

The Twitchell is Tire Insurance

See the Twitchell Gauge at any of the big Automobile Shows and be convinced of its merits. A tire gauge that can carry the advertising we are giving the Twitchell **must** be a **good** tire gauge—it must be **the best gauge to use**—consequently **the best gauge to sell** if you are a dealer.

THE TWITCHELL GAUGE COMPANY

1201 Michigan Avenue, CHICAGO, ILL.

A Certainty In Transmissions

Because experience teaches we are unquestionably at the head of the Transmission class. It would be a severe reflection upon our mechanical aptitude to doubt our ability to build the very best possible transmission.

Our pre-eminent position today as transmission specialists was not attained without travail. We, like all who must learn largely by experience, have had our problems. Why should you go over the same road when the finished product can be had for less than it would cost you to build?

Also, we have our triumphs, and the greatest of these is the fact that, once secured, we do not lose an account. Our 1913 business is now actually twice that of the past year, which was a record breaker.

Covert Motor Vehicle Company

Factory: Lockport, N. Y.

Sales Office: 1422 Ford Building, Detroit, Mich.

If selling tires is your *business* why not be the *representative* dealer in your community?

IT is possible for every tire dealer in the country to occupy the same dominating position in his own field that the United States Tire Company occupies in the nation.

He can be a *leader*.

Four-fifths of all the best dealers now handle United States Tires and there are many decidedly logical reasons why these men, interested in the future of their business and in the welfare of their customers, should line up with this organization.

In the first place no one seriously disputes the leadership of the United States Tire Company in the tire field. Its factory resources are epoch-marking in the history of the tire industry—four immense plants where tires are manufactured with the one fixed purpose of producing a uniform standard of quality.

Tires made as United States Tires are made can safely be sold under any good dealer's personal recommendation.

Added to these magnificent production facilities is a comprehensive sales organization which places the dealer always in close touch with the factory output.

And behind these manifestly advantageous resources is the United States Tire Company's policy of co-operating with the dealer instead of competing with him.

Do you know of any more certain way to dominate] the tire field in your own particular community than by selling America's *Predominant* Tires, with the co-operation and backing of the world's leading tire concern?

UNITED STATES TIRE COMPANY
NEW YORK

SPLITDORF

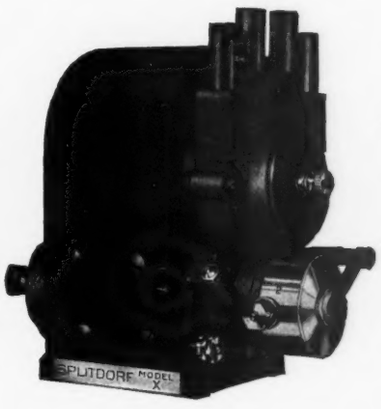
"Always There"

SPLITDORF ignition devices are making rapid headway in the choice of owners and drivers of the automobile, the motor truck, the motor boat, the motorcycle, the aeroplane and the motor driven farm implement. Sheer merit has brought them to the front in the face of the closest competition.

SPLITDORF PLUGS are not experimental—they are STANDARD. Known since their first appearance as the "common sense plug," they are exactly that—no more and no less. SPLITDORF PLUGS will outlast your motor. There is nothing fanciful about them—they are made to endure any and every strain of ignition put upon them.

Four magnetos of the well-known SPLITDORF low tension type are making their appearance for the first time, minor structural changes on the older styles giving the latest models a smoother and more compact appearance. Models "W" and "Z" are of the 3-pair magnet type, designed for heavy, low speed 4 and 6 cylinder motors respectively, while the "X" and "Y" are of the 2-pair magnet type for 4 and 6-cylinder motors respectively, in which efficiency has been raised to the highest standard.

If interested in any form of ignition for gasoline motors, just write in for our free literature. Our new catalog, our "Racing Record" or our "New Lights for Old" is yours for the asking. Do it TODAY.



Splitdorf Electrical Company

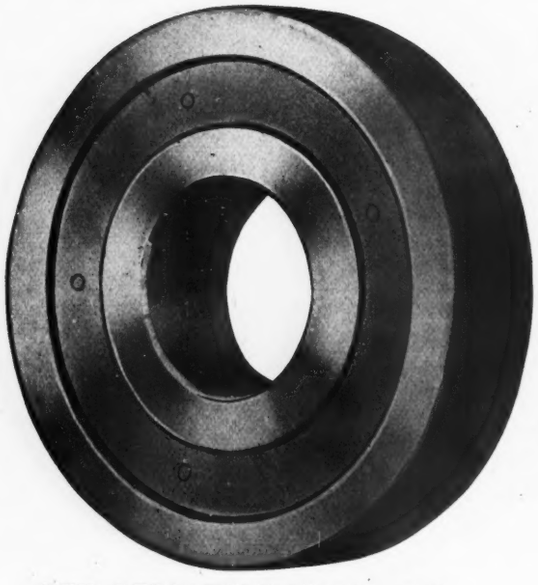
98 Warren Street
NEWARK, N. J.

BRANCHES

NEW YORK.....18-20 West 63d Street
BOSTON .....180-82 Massachusetts Avenue
PHILADELPHIA .....Juniper and Cherry Streets
CHICAGO .....1110 S. Michigan Avenue
DETROIT .....868 Woodward Avenue
KANSAS CITY .....1823 Grand Avenue
SEATTLE .....1628 Broadway
LOS ANGELES .....1228 South Olive Street
SAN FRANCISCO .....430 Van Ness Avenue
LONDON BUENOS AIRES

NEW DEPARTURE BALL BEARINGS

American Made *for* American Trade



NEW DEPARTURE SINGLE ROW

NEW DEPARTURE *guaranteed* Ball Bearings are the supreme expression of the bearing builders' art—up to the minute. They are made by American methods and in every way satisfy the exacting requirements of the American trade. The fact that these bearings are in more than 75% of American built cars for 1913 proves the quality of the bearings and the advantage to the American manufacturer of installing them in his car.

Manufacturers have preferred New Departures because—

Quality of Steel. Our experts have found a steel that is particularly adapted to ball bearing work because of its great strength, resiliency and toughness. The development of this steel is the result of many months' study, experimenting and testing in our chemical, metallurgical and physical testing laboratories. Each lot of steel coming in is scientifically analyzed before being sent into the factory. If it does not hold up to established standards it is rejected. The user of New Departure ball bearings is therefore assured that the material in these bearings is adequate and satisfactory, and superior—guaranteed.

Quality of Workmanship. We employ the best mechanics we can find—this in line with our determination to maintain a quality that cannot be excelled anywhere in the world. Our plant is equipped with the most modern machinery, including machines of our own invention and used exclusively in our plant. Our system of inspection is an effective check against poor workmanship. Each bearing is inspected not less than thirty-one times during the process of manufacture.

Quality of Finish. New Departure ball bearings are more insistently gauged and tested for uniformity of dimension and strength and for accuracy of finish than is any other. Our inspectors work within exceedingly close limits and discard for the slightest imperfections.

New Departure Ball Bearings are made in three types:

Double Row—Combined radial and thrust,
Single Row— Strictly radial,
Radax— Radial and one direction thrust.

See the interesting exhibit of this American made ball bearing at Madison Square Garden Automobile Show. Space 204 Balcony—Both weeks.

THE NEW DEPARTURE MFG. CO., BRISTOL, CONN.

Western Branch: 1016-17 Ford Building, Detroit

62A

Warner AUTO-METER

The WARNER AUTO-METER

(Magnetic Type)

Is the ***"Dominant Speedometer"*** with both the makers and the owners of high priced American motor cars. Nearly all of the makers of high priced automobiles are now installing the Warner as "regular equipment" on their cars. In their catalogs and in their newspaper, periodical and magazine advertising you will find the name "Warner" displayed prominently in bold type. They want that name to catch the eye of the prospective car buyer. Makers of the highest priced cars specify the Warner in their advertising and install it on their product because they know that the class which purchases their cars—keen, well-posted, fastidious buyers—insist on the highest quality of equipment and will have none other than the Warner Auto-Meter. Owners of high priced cars are proud of the Warner Auto-Meter equipment because it has a reputation for highest excellence and in keeping with their standard of exacting requirement.

SPECIAL

We have arranged to place the splendid facilities of our Beloit factory at the disposal of automobile engineers for the purpose of designing new models of speedometers, with special installations and driving equipment adapted to meet the individual requirements of each special make of motor car.

For sale by leading dealers all over the world and at our branches listed below. The prices are never changed—never cut. They never vary. You pay the same price in one state as you would in another. Priced from $50 to $145, according to size and style.

The Warner instrument is ***made like a fine watch.*** It is a thoroughly jeweled instrument. The jewels used are ***select first quality Sapphires,*** accurate to 1-2000th of an inch and polished like a diamond. These sapphires insure absolute precision—for life.

Handsome Catalog on Request

Stewart-Warner Speedometer Corporation

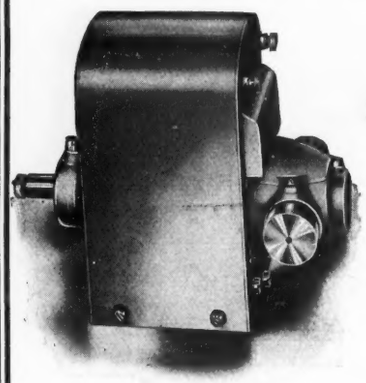
Factories: Chicago and Beloit

General Offices: 1931 Diversey Blvd., Chicago

New York Los Angeles Chicago Minneapolis Kansas City San Francisco
Detroit Philadelphia Indianapolis Cleveland Boston St. Louis Atlanta Buffalo
Cincinnati Denver Pittsburgh Portland Seattle Toronto London Paris

Model K2
Price $75

The Wells Generator Lights The Way



An Automatically Regulated Electric Lighting System for 1913 Cars

Motorists and manufacturers the United States over have long demanded an Electric Lighting Generator that would **automatically** regulate its current output **at all speeds,** have a **constant** battery charging rate, and be so designed that the supply of current stored in the battery sufficed at all times to take care of the lights when the car was not running.

A Generator of such trouble-proof qualifications and unswerving efficiency is to be had in the

Wells Electric Lighting Generator

It was designed by engineers who devote their entire time to the solution of motor car lighting problems—men who assured themselves that the WELLS GENERATOR was without equal, before they permitted it to be marketed. They proved to their own satisfaction that it **cost more right along** to be without a WELLS LIGHTING SYSTEM than to purchase it **once.**

"Reasons Why" the Wells Lighting System Should Be On Your Car

It is small, compact, and has few parts. It cannot be thrown out of adjustment as **there is nothing to get out of order.**

It is absolutely simple: there are no special windings or complicated regulating devices such as friction drives in its construction. The number of wearing parts is reduced to a minimum.

It maintains a **constant** battery charging rate regardless of speed, be it 5 miles or 80. There is positive control of current output so that the battery is never injured or overcharged.

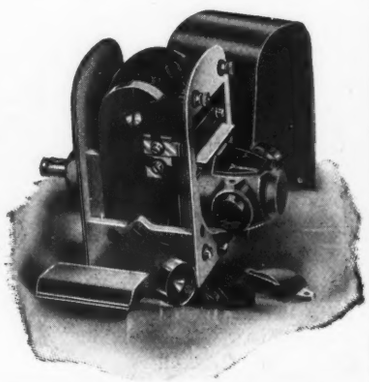
The scheme of wiring is simple, convenient and economical to install. The Generator is fully enclosed. There are no openings to draw in grit or dust.

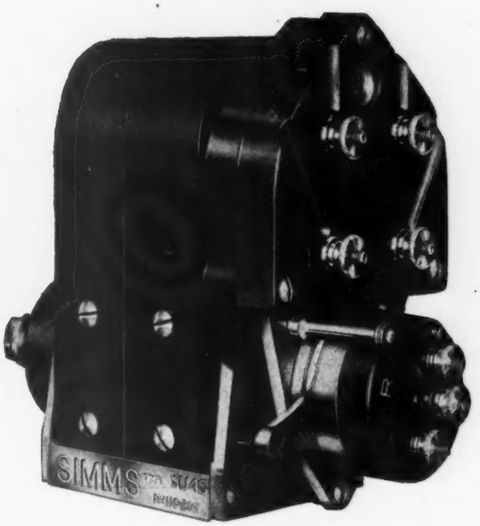
It will last as long as the car

Write for Prices and full Particulars

R. C. Wells Mfg. Compy.

Wells Building
Fond du Lac
Wis.





The American SIMMS MAGNETO

Highest Efficiency and Durability GUARANTEED

Exhibiting at Grand Central Palace and Madison Square Garden Show

SIMMS
TRADE MARK
QUALITY
EFFICIENCY RELIABILITY

THE SIMMS MAGNETO COMPANY

General Offices, 1790 Broadway, New York
Factory, Bloomfield, N. J.

TESTS INVITED—We are ready to prove the superiority of the Simms Magneto.

The DIXON METHOD

THE DIXON method of lubrication calls for the most careful attention to those parts of the motor most commonly neglected, namely, *the microscopic metallic surfaces which appear smooth to the naked eye*, but which are in reality a source of great wear and tear.

The object of perfect lubrication is to provide a film sufficiently thick to prevent contact of the wearing metallic surfaces. It must, however, be sufficiently fluid so as not to cause excessive friction within itself. This is ideal lubrication—*and it is seldom realized.* If it were there would be no appreciable wear and tear on cars and they would last infinitely longer than they now do.

DIXON'S Flake Graphite

covers the rough metallic surfaces and reduces friction between the wearing parts. It is not a complete substitute for oil or grease, but is intended to supplement both and its use in this capacity means the nearest possible approach to perfect lubrication, more horsepower and a minimizing of wear and tear—giving longer life to the motor.

JOSEPH DIXON CRUCIBLE COMPANY
Established in 1827
Jersey City, N. J.

The TRUTH ABOUT LUBRICATION

ONE truth about lubrication, so often overlooked, is that one lubricant cannot be used in all parts of the automobile. Realizing this fact, we have endeavored to provide lubricants of different viscosity and varying body to meet the demands of all the different parts.

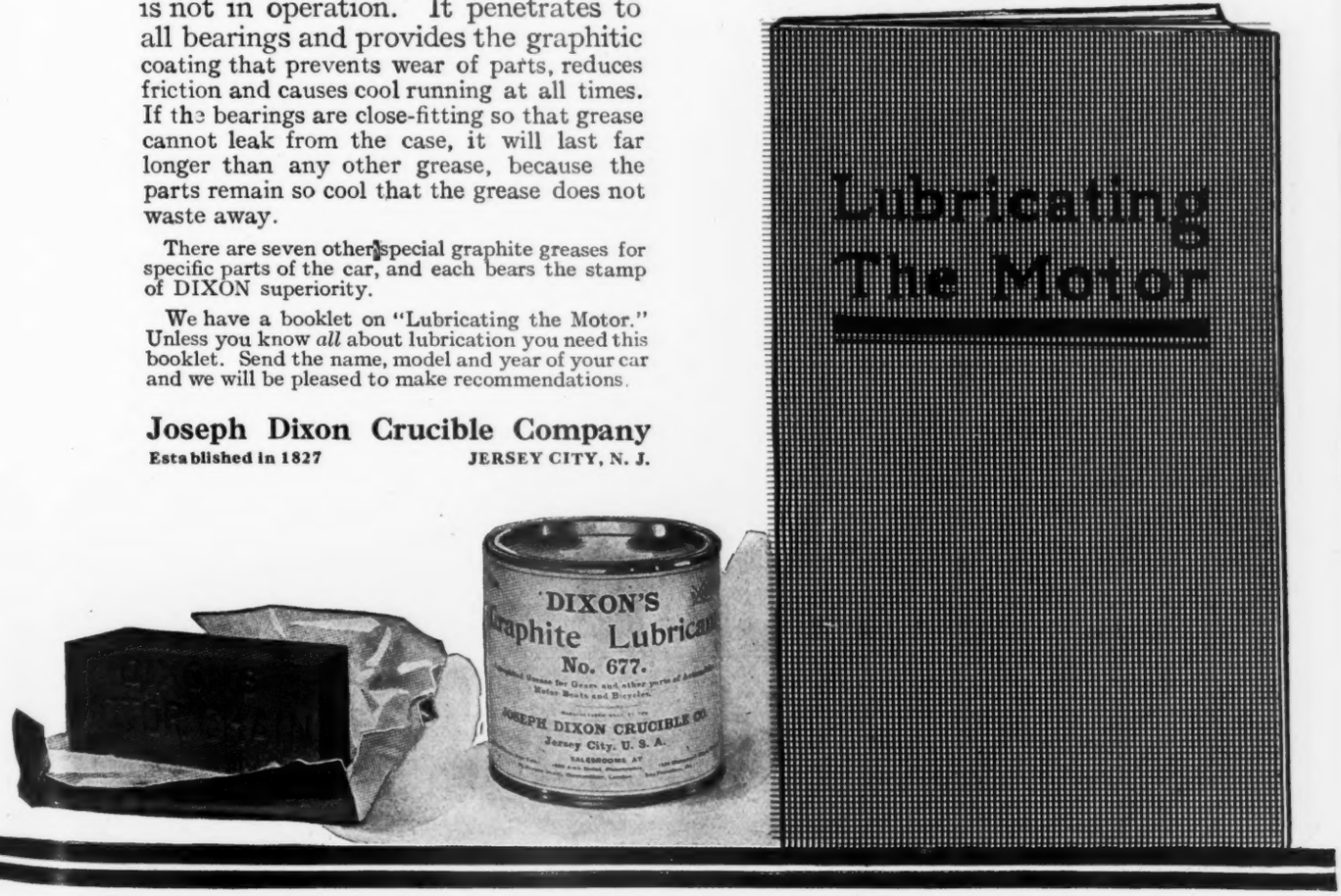
DIXON'S Graphite Grease No. 677

is just the right consistency for the transmission and differential gears of practically every car on the market. It flows with the gears at all temperatures, yet possesses the peculiar property of not running off the gears when the car is not in operation. It penetrates to all bearings and provides the graphitic coating that prevents wear of parts, reduces friction and causes cool running at all times. If the bearings are close-fitting so that grease cannot leak from the case, it will last far longer than any other grease, because the parts remain so cool that the grease does not waste away.

There are seven other special graphite greases for specific parts of the car, and each bears the stamp of DIXON superiority.

We have a booklet on "Lubricating the Motor." Unless you know *all* about lubrication you need this booklet. Send the name, model and year of your car and we will be pleased to make recommendations.

Joseph Dixon Crucible Company
Established in 1827 JERSEY CITY, N. J.



See! how much better this Top looks

This one is genuine *Pantasote*—always fresh and clean.

"Look at the other one—how seedy and shabby it looks—you can tell quick as a wink that it isn't genuine *Pantasote*.

"A *Pantasote* Top is so easy to keep clean that there is no excuse for its ever looking shabby.

"A little soap and water when you are washing your car will keep your Top freshened up.

"Even when it gets stained with road oil, you can clean it off without any trouble."

Pantasote is the standard curtain material used in every Pullman Car. The Pullman Company chose ***Pantasote*** because it looks well and it wears like flexible steel.

That's the kind of material you should have on your Top.

The most severe service conditions are discounted when ***Pantasote*** is being manufactured. It is the **only** Top material that looks well and wears well—the one that is rain-proof, sun-proof, sleet-proof, cold-proof, wind-proof, snow-proof, heat-proof, crack-proof, and pretty nearly fool-proof.

Send today for your copy of "The X-Ray on Automobile Tops." Describes fully all the different Top materials, it explains how they are made and just how they differ. After you have read "The X-Ray" you will note just what you are buying when you buy ***Pantasote***. Send for that copy today.

THE PANTASOTE COMPANY
No. 31 Bowling Green Bldg.
NEW YORK CITY

SALISBURY

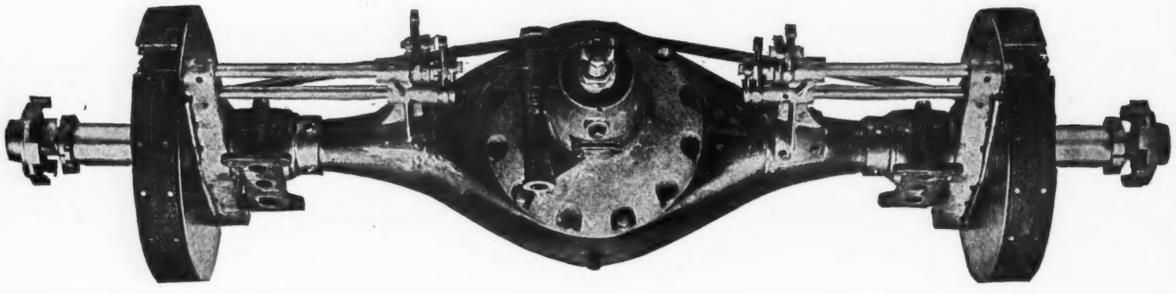
BUILT ON SOUND PRINCIPLES AXLES

The business of the Salisbury Wheel & Mfg. Co. was established in 1901 as a Wheel and Hub business, and its product, then as now, was equal, if not superior, to anything on the market. The business grew rapidly, and axles were added to the line in 1904. There has been a general evolution in axle production, as well as in other equipment of the Automobile, and the Salisbury Company has kept abreast of the times, and a little in advance. It today offers its customers the very latest and best in construction, and has Plants to meet large requirements in deliveries. Its Engineers and Sales Department will be glad to take up the matter of contracts for the coming year with any responsible Motor Car builder, and demonstrate that they can meet any sound requirements.

Three Plants associated, an element of safety.

PERU AUTO PARTS MFG. CO.
PERU, IND.

GREENVILLE METAL PRODUCTS CO.
GREENVILLE, PA.



SALISBURY WHEEL & MFG CO

JAMESTOWN N.Y.

Continental

A Motor that Confers Distinction on Every Car It Drives

A man speaks with pride of the Continental Motor in his car.

A manufacturer installs it; and advertises the fact.

Both are moved by the same impulse; and behind that impulse is the universal recognition of the Continental as a mark of high quality and distinction.

The Continental is so accepted because it long since has proved its right to the fullest confidence of the car owner and the car manufacturer.

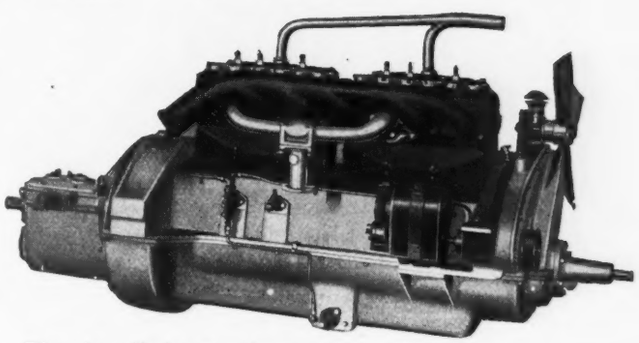
Think of a car powered with a Continental motor.

Recall what you have heard said about it, not only by men who own that particular make, but also by men who own others.

Recollection will tell you that the car's reputation is high—it is regarded as a good car.

This idea, as we have said, is widespread.

A Continental Motor is looked upon as standing sponsor for the quality of the car.



The six-cylinder Continental unit power plant.
Bore, 4⅛ inches; stroke, 5¼ inches. Built to accommodate any type of self starter now made. Suitable for right or left hand drive. Four cylinder types—20 to 70 H. P.

We want you to get acquainted with the Continental—whether you are owner, engineer or manufacturer.

It will not be troublesome to do this, for at both the New York and Chicago shows many of the leading pleasure cars and trucks will be equipped with the Continental.

Note, also, the large percentage and class of these cars; this will be impressive testimony.

Specifications, literature, etc., mailed on request.

Continental Motor Mfg. Co., Detroit, Mich.

Factory Representative

K. F. Peterson, 122-S Michigan Blvd., Chicago, Ill.

Chicago Show Exhibit—February 1-15—Space 56, Coliseum Gallery

New Electric Lighting Accessories

G-E connectors, plugs, receptacles and sockets for automobile wiring have been completely redesigned.

The main improvements are: The protected base plugs, receptacles and connectors; these provide a complete equipment of metal shell protected devices in which the strain of connection is taken by the metal shells. All lighting circuit connections are therefore rendered sturdy in construction and thoroughly weatherproof.

The new interiors are of tough molded compound which will withstand all degree of temperature and moisture; one of the chief advantages of this new compound is its adaptability to soldering operations.

All single end sockets are supplied with either through plunger contacts or sliding spring contacts. Double end sockets are supplied with sliding spring contacts only.

In the sliding spring contact type of devices the contact is made between plunger and metal sleeve and not through the spring; thus making contact sure and positive.

Cat. *G-E 196

Protected sleeve connector. For use in main line circuits between chassis and car body.

Cat. G-E 187

Standard open base plug. This style plug can be used in connection with all sockets which take standard candelabra base lamps. Plug base is same length as lamp base and fits long slot sockets and receptacles without the loose effect observed in old style short base plugs and receptacles.

Cat. G-E 188

Extended sleeve protected base plug. This style of plug connects with double end sockets to form weather protected couplings at side and rear lamps.

Cat. *G-E 198

Straight Sleeve Socket (closed back), for headlights or side lights where connector or body receptacle is used and permanent wiring is made at lamp instead of car body. These sockets can be used as plugs in connection with protected sleeve receptacles, also made with center flange for use in side and rear lamps where flange is wanted.

Cat. *G-E 200

Straight sleeve sockets. Same as Cat. G-E 198, but with open back; recommended for headlights.

Cat. G-E 202

Double end socket, made particularly for side and rear lights where plug connection is made at lamp. This socket will take both base and protected base type of plug.

Cat. G-E 189

Extended sleeve flush flanged receptacle (open back). These receptacles can be used in car body in connection with standard sockets where sockets are used as straight sleeve protected base plugs.

This same receptacle in closed back type is also standard.

Cat. *G-E 214

Flush flanged socket (open back). These sockets are designed for use as lamp sockets or as body receptacles in connection with open base plugs; made also in closed back type.

* These catalogue numbers cover through Plunger contacts.

General Electric Company

Largest Electrical Manufacturer in the World
General Office: Schenectady, N. Y.
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Youngstown, Ohio

For Texas and Oklahoma business refer to General Electric Company of Texas—Dallas, El Paso, Houston and Oklahoma City.
For Canadian business refer to Canadian General Electric Company, Lt'd, Toronto, Ont.

3932

STANWELD demountable rims, series No. 40, stand alone in their pre-eminent efficiency.

Universal in their acceptance of tires, automatic in their mechanical operation, combining both a quick detaching and demounting feature which operate independently, and positively preventing wobbling of tires, they surmount all the defects of former types of demountable rims.

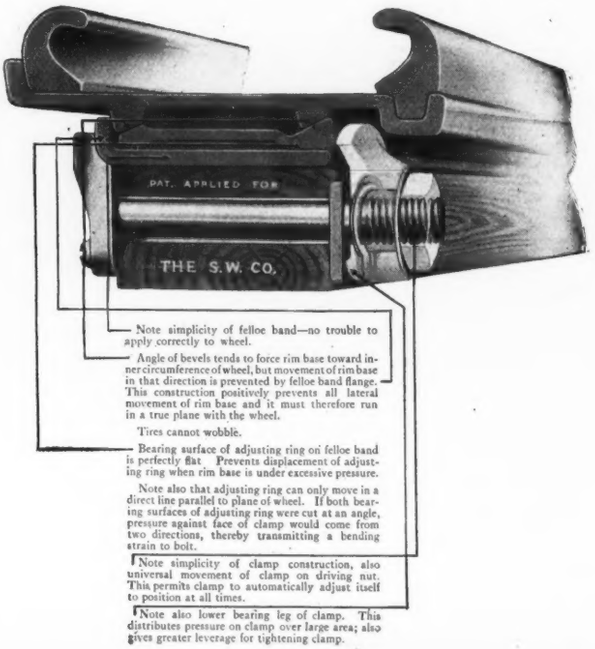
STANWELD rims, No. 40 series have an entirely new feature for the securing of the rim base to the wheel —The adjusting ring. This device is an intermediary band that lies under the entire rim base and supports it at all points of the front and rear circumference.

The rim base has the felloe band flange as a guage for its lateral position and must always lie in the same perfect position on the wheel no matter how the clamping devices are tightened. This is the preventive of tire wobbling, one of the prime reasons for excessive tire expense.

Number 40 **STANWELD** rims are the wheel equipment on all leading makes of cars.

The Standard Welding Co.

Cleveland, Ohio



STANWELD Rim No. 30 is designed for those who require a demountable rim of minimum weight and extreme simplicity.

It has both the quick detachable and demountable features and is made in two styles, one for straight side tires and one for clincher.

This rim is split circumferentially, the two sections having corresponding lugs that are locked together by two semi-circular rings. One end of each ring is securely rivited to the wider portion of the rim base. The free ends of these rings are secured by a swinging latch which is in turn locked by a cam latch.

No special tools are required to operate this rim and no circumferential movement of either section is necessary to disengage the two parts of the rim base.

The rim base of **STANWELD** Rim No. 30 will fit the felloe band of either the Continental Gilbert type rim or the Standard Universal No. 3 rim, without requiring any special wheel work or additional equipment.

The Standard Welding Co.

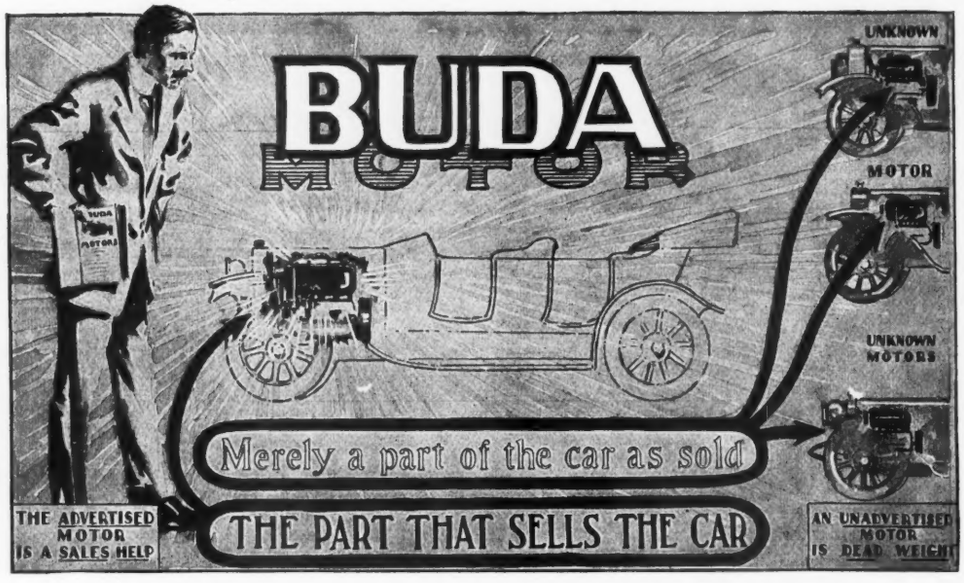
Cleveland, Ohio

The CAR that MOVES

is the One Whose Motor the Public Wants

After all, what is a Car or Truck? Nothing but an "assembly of accessories." Whether it is a "Good Buy" and an "Easy Seller" depends upon whether these accessories are *selling force* or *dead weight*, whether they are *parts that SELL THE CAR* or *merely parts of the car to sell.* It is a known fact that *one accessory* can *kill* a sale or *close* a sale. Many a car has been moved from the stock room by the

DIFFERENTIATIVE MERITS OF THE



Of course the basis of all public demand in the case of the BUDA rests finally on such exclusive points of merit as its "get-at-ableness," its special oiling device, the certainty of always being able to secure interchangeable parts and its demonstrated efficiency as is testified to by the following partial list of manufacturers for whom we have made motors:

Pleasure Cars:

Hudson Motor Car Co.
Michigan Motor Car Co.
Henderson Motor Car Co.
Lenox Motor Car Co.
Schacht Motor Car Co.
Spaulding Mfg. Co.
Croxton Motor Co.
Nova Scotia Carriage and Motor Car Co.
Miller Motor Car Co.
and others

Trucks:

Service Motor Car Co.
Bowling Green Motor Car Co.
Durant-Dort Carriage Co.
Hewitt-Ludlow Auto Co.
Tiffin Wagon Co.
Brantford Motor Truck Co.
W. Landshaft & Sons
Harvey Motor Truck Co.
Hurlburt Motor Truck Co.
Schacht Motor Car Co.
Chicago Pneumatic Tool Co.
Lord Baltimore Motor Car Co.
U. S. Government and others.

The Buda "Little Six"

will be ready for delivery by April first and is a product worthy of the Company which was the Pioneer of the "Cast-in-Block" method in U. S.

SHOW NOTICE:

We have spaces at all three of the 13th Annual Automobile Shows as follows:
Grand Central Palace, New York, January 11th to January 25th, Space No. 304, located in the Balcony.
Madison Square Garden, New York, January 11th to January 25th. Space No. 326, located in the Concert Hall.
Coliseum, Chicago, February 1st to February 15th. Spaces Nos. 102, 103, 104, located in Coliseum Annex, 2nd floor.

1913 Specifications
for Hyduty Commercial Motors:

Model "M" Motor, 3¾ x 4½
Model "Q" Motor, 3¾ x 5½

Long Stroke, Enclosed Valves, Noiseless Timing Gears, Self-contained Oiling System. Extra large Valves and Bearings. Ample water jacket.

For Special Bulletin Write to

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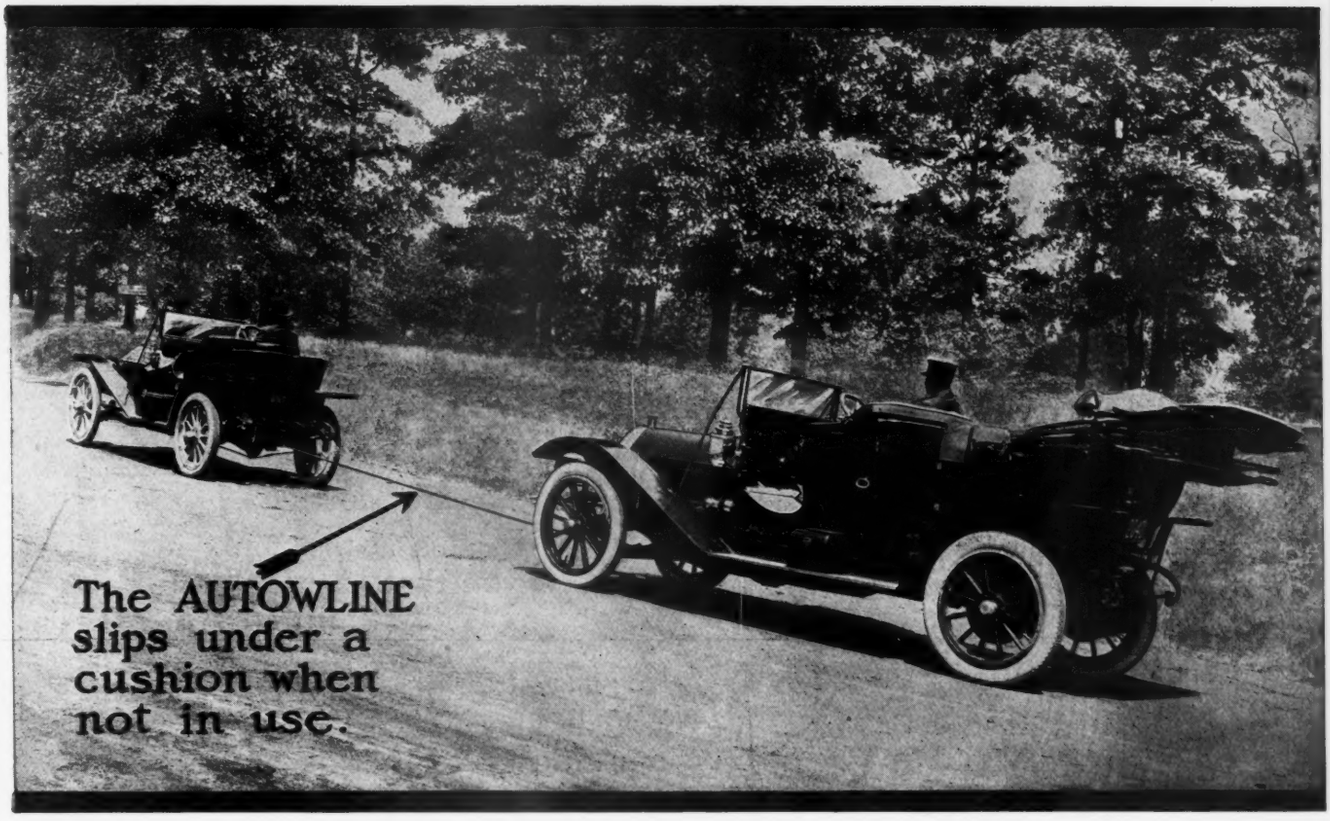

YOUR car isn't fully equipped unless there's one of our flexible steel Autowlines under the seat.

"BASLINE AUTOWLINE" is just as necessary as a spare tire or a gas tank.

"BASLINE AUTOWLINE" is the original and only steel towline. It's 30 feet long, 5/16 inch in diameter and weighs only six pounds. But it has an approximate strength of 7000 pounds.

With strong ½-inch Manila bolt rope slings attached to each end of the "Autowline," you can hook up for towing in less than one minute, without scratching or marring the paint in any way or in any place.

Besides being the ideal light and handy towing line, **"Basline Autowline"** is simply wonderful for starting a stalled wheel out of a bad rut on your own power.

"Basline Autowline" is clean, compact, and **always ready for any emergency.** Takes up no room and adds practically no weight. Coil it up right and it will never kink.

"Basline Autowline" is immeasurably superior to common manila towline, which is bulky, unsightly, and absorbs dirt, grease and moisture.

Used on the Glidden Tour and Coast-to-Coast tours. Endorsed by thousands of motorists in every state in the Union.

Patented

Steel Towline

$ 375 Patented

Trade Mark Registered

Free Put your mind at rest today by buying a "Basline Autowline" from your favorite Supply Dealer. The price is only $3.75. The box gives you full directions. Write for special illustrated folder telling all about this Little Steel Rope With the Big Pull.

BRODERICK & BASCOM ROPE CO.
ST. LOUIS, MISSOURI

Basline Autowline $3.75

This is the non-skid tire that is given preference by tire users who have passed through the school of experience. The Federal Rugged Tread is a non-skid tire that effectively overcomes the difficulties of winter motoring.

FEDERAL
RUGGED TREAD
TIRES

The rugged build and extra thick tread of Federal Rugged Tread Tires make them unusually economical and lasting in service.

The heavy base studs firmly grip the road, giving full power traction under all conditions.

When you next purchase tires, specify Federal Rugged Tread

Made in Clincher, Quick Detachable Clincher and Straight-Wall (oversize and non rim-cut) types.

Federal Tires are procurable at leading dealers and auto supply houses.

Federal Rubber Manufacturing Co., Milwaukee

Branches and Agencies—New York, Boston, Chicago, Kansas City, Minneapolis, Denver, Indianapolis, Columbus, St. Louis, Louisville, Omaha, Little Rock, Atlanta, Los Angeles, San Diego, Pasadena, New Orleans, Portland. (Federal Rubber Mfg. Co. of Texas—Dallas, Houston, San Antonio.)

On Display at the Shows

CONNECTICUT

SHOCK ABSORBERS

Act Only When the Car is in Need of a Shock Absorber

On a good road they do not make the car ride hard.
On a bad road they prevent bumping or upthrow.

This check will be more or less as the road is bad or fair.

The action is automatic.

The first adjustment is the only adjustment and takes care of all conditions of road and load.

A lasting guarantee of comfort, economy and safety.

And these are some of the reasons why such discriminating car manufacturers as

ALPENA
AMERICAN
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DORRIS
KNOX
KISSEL
MATHEWSON
NORWALK SIX
PIERCE-ARROW
RUSSELL (Canada)
SCHACHT (Canada)

equip all their cars at the factory with Connecticut Shock Absorbers in preference to any other.

Sold with thirty day's trial installed on car.

Write for Bulletin No. 25

CONNECTICUT SHOCK ABSORBER CO., Inc.
MERIDEN, CONNECTICUT

BRANCHES:

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WESTON-MOTT CO. FACTORIES AT FLINT, MICH.

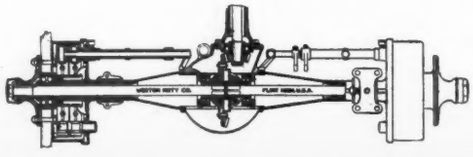
WESTON MOTT CO

FLINT, MICH.

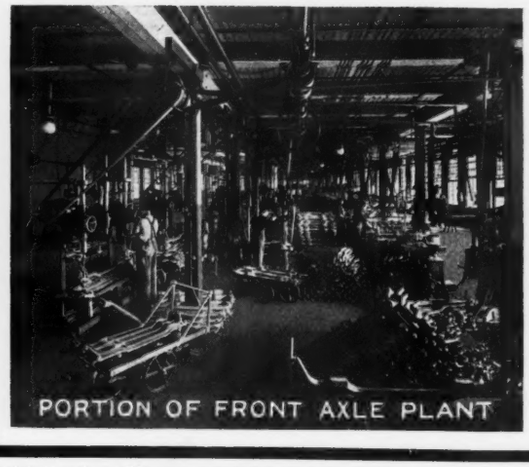
The unequalled success of the Weston-Mott Co. in the manufacture of automobile

AXLES
HUBS
RIMS

Is the result of many years of actual experience combined with the efforts of engineering ability of the highest order and mechanical skill that has no superior.



PART OF FRONT AXLE PLANT



PORTION OF FRONT AXLE PLANT

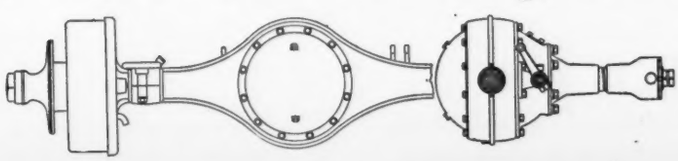
LARGEST MAKERS OF AUTOMOBILE AXLES, HUBS AND RIMS IN THE WORLD

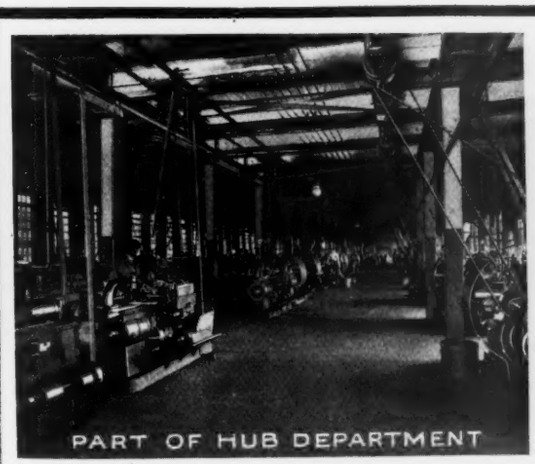
WESTON MOTT CO

FLINT, MICH.

VISIT OUR EXHIBIT AT THE NEW YORK SHOW

There you will find the latest products of our mammoth plant. At least one big surprise awaits you.





PART OF HUB DEPARTMENT

ANOTHER PART OF FRONT AXLE PLANT

No-Rim-Cut Tires
10% Oversize
By Far Outsell All Others

This Winter Tread

Will Indicate Why the Goodyear Won

Last year we sold 918,687 automobile tires.

Yet we failed to keep up with the flood-like demand by some 400,000 tires.

Seven years ago only one tire in ninety was a Goodyear tire.

Three years ago the demand was still one-twelfth as large as now.

Last year's sales by far exceeded our previous 12 years put together.

What has awakened men to Goodyear tires in this overwhelming way?

This winter tread will tell you. It shows how far we go, in every way, to multiply efficiency. To cut down tire expense.

This is only one item, but it reveals the entire Goodyear code.

Compare this tread with others, and you'll see why Goodyears won.

Note the Double Thickness

In this Non-Skid tire we add an extra tread almost as thick as the regular. Thus we give you a double-thick tread.

This extra tread is of very tough rubber, immensely enduring, almost impervious to wear.

Because of its thickness, the blocks are deep cut. Their non-skid efficiency lasts for thousands of miles.

A Bulldog Grip

These sharp-cut blocks present to the road surface countless edges and angles.

They grasp the road in every direction with a fairly irresistible grip.

But the greatest advantage lies in the fact that these blocks widen out, so they meet at the base.

They are not separate projections, which center the strain on a small part of the fabric. They distribute the strain exactly the same as with smooth-tread tires. That's the main reason why the Goodyear Non-Skid gives such exceptional mileage.

Compare this tread with others. Compare its thickness, the depth of its projections. Compare the apparent efficiency, due to these sharp-cut blocks.

Compare the way in which strains are distributed so the fabric can't be broken. One glance will show you that this Non-Skid surpasses anything else of its kind. About 250,000 of these treads have already been tested out.

Other Troubles Ended

Thus we have ended skidding troubles in the most effective way.

Years ago we ended rim-cutting, just as completely, just as efficiently.

Our patent tire—the No-Rim-Cut tire—has made rim cutting simply impossible.

And that alone cut tire expense 25 per cent.

Our 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage.

Our 14 years of ceaseless tests and comparisons have brought our tire quality up to the maximum.

These things together, in the test of time, have placed the Goodyears on at least a quarter million cars.

One Must Respect This Verdict

Remember, please, that tire expense forms your major cost of upkeep.

A tire which cuts that cost in two is something quite important.

Men know when they get it in these days of odometers. They know which tire serves best. And the final verdict of these men who know favors Goodyear tires.

Men have tried and compared now pretty close to 2,000,000 Goodyear tires. As a result the sale of these tires has doubled every year. And last year's increase was 125 per cent.

Now these tires by far outsell all others. And this year's output, if this increase continues, will completely equip 500,000 cars.

One may easily question any maker's claims. But when hundreds of thousands of users unite, one must respect their verdict.

The verdict of experience favors Goodyear tires in an overwhelming way. And every month makes the verdict more convincing.

Is it not fair to suppose that your experience will bring a like result?

If you think so, get that experience. Make some comparisons. Settle this question by next time insisting on Goodyear No-Rim-Cut tires.

Write for the Goodyear Tire Book—14th-year edition. It tells all that we know, after fourteen years, about cutting down tire expense.

GOODYEAR
AKRON, OHIO

No-Rim-Cut Tires
With or Without Non-Skid Treads

THE GOODYEAR TIRE & RUBBER COMPANY, AKRON, OHIO

Branches and Agencies in 103 Principal Cities
More Service Stations Than Any Other Tire

We Make All Kinds of Rubber Tires, Tire Accessories and Repair Outfits
Main Canadian Office, Toronto, Ont.—Canadian Factory, Bowmanville, Ont.

(934)

Save 9/10 of Your Tire Repair Expense

For 2 cents you, yourself, can **permanently** repair every puncture or blowout in tube, or cut in casing. Easier, quicker and better than vulcanizing. Costs one-tenth as much. No heat or tools needed. Nothing but your two hands and

TIRE-DOH

Now $1 **Formerly $2**

Use the Tire-Doh Outfit anywhere—in the shop or on the road. Cut your tire repair expense down to almost nothing. Tire-Doh means freedom from big tire repair bills and annoying delays. Double the life of your casings by promptly repairing cuts and blisters with Tire-Doh.

The Outfit comes only in white enameled can as shown above, and consists of one can of Tire-Doh, and one can of Tire-Doh Cement. Neither Tire-Doh nor Tire-Doh cement is ever sold separately or under any other label.

Price now **$1.** Just as much Tire-Doh and Tire-Doh Cement as in the old $2 Outfit. Ask your dealer for a Tire-Doh Outfit today. Or send us $1 for a Tire-Doh Outfit express prepaid. You run no risk. Money back if you ever ask it. But insist upon genuine Tire-Doh if you want our money-back guarantee.

ATLAS AUTO SUPPLY CO., 3243 W. Lake St., **Chicago**

One Rub

Turns Brass to Silver

Talk about your nickel plated lamps! In a few minutes you can **silver** plate every piece of bothersome brass or copper on your car. All you need is a piece of cheese-cloth and a bottle of

Silver Quick

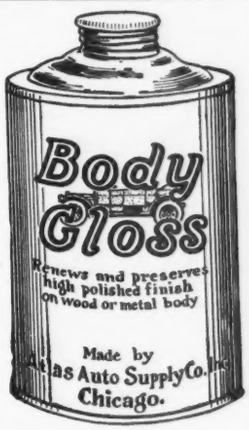
One Rub
Turns Brass to Silver

Get away from that cheap brassy look. Make your car look up-to-date. Use Silver-Quick and say good-bye to polishing forever. When long exposure has made the first coat dull, just use Silver-Quick again. It's easier than polishing. Silver-Quick is not mercury or quicksilver. It gives a genuine silver plate. $1 bottle will silver plate all brass work on any car.

Make a note now to ask your dealer for a bottle of Silver-Quick. Or send us $1 now. You run no risk. We absolutely guarantee Silver-Quick to be and do everything we claim for it. We will give you your money back if you ever ask it.

ATLAS AUTO SUPPLY CO., 3243 W. Lake St., **Chicago**

Keep Your Car Looking Like New



Preserve the beautiful luster and finish of your car. Use BODY-GLOSS. An hour's easy work once a month keeps a car shining and new looking. A wonderful varnish renewer. The only perfect refinisher. Easy to apply. Simply pour on cloth and rub on. Finish with dry cloth. Economical. A pint goes over any touring car **twice.** BODY-GLOSS will not restore the finish to a body that needs painting. But its use will preserve for an indefinite period the original luster of a well finished car. Use BODY-GLOSS and your new car will *always* look new. Ask your dealer. Pint can, 75 cts.; Quart can, $1.25.

ATLAS AUTO SUPPLY CO., 3243 W. Lake St., **Chicago**

FREE **This coupon good for a sample can of Body-Gloss. Only one to each person. Present coupon at your dealer's.**

Dealer's Name .....Name .....

Address .....Address .....

Atlas Auto Supply Co., Chicago.

Save Your Tires

Preserve your tires. Increase tire mileage. Make your tires look bright, white and new. Coat them with Preserv-O Tire Paint. Penetrates into every cut and crevice of the casing, leaving the tire coated with a new, perfectly waterproof surface. Preserv-O Tire Paint dries in 15 minutes and then cannot rub off. Cannot harm tires. Contains nothing not actually used in making the tires themselves. Economy, as well as pride in the appearance of your car, dictates the use of Preserv-O Tire Paint. This is the best tire paint on the market. A trial will prove it. Pint can, enough to coat six big tires, 50 cents. Get a can today of your dealer. You run no risk. Money back any time you ask it.

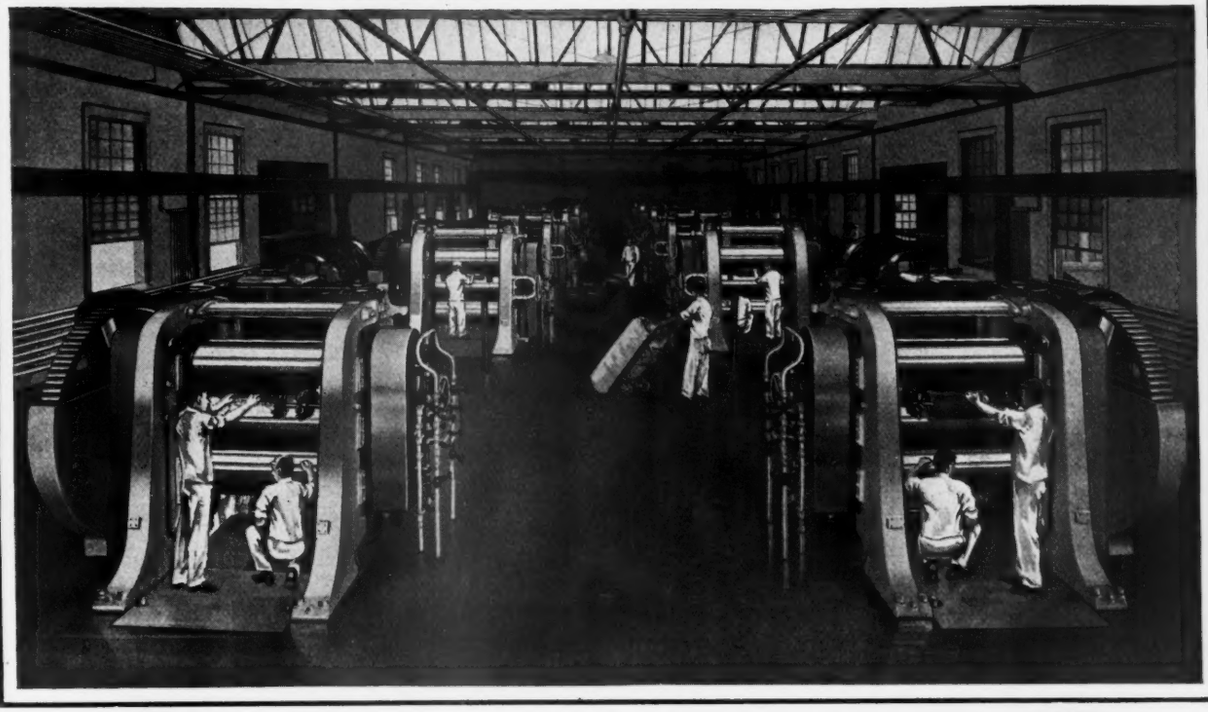
ATLAS AUTO SUPPLY CO., 3243 W. Lake St., **Chicago**

FREE **This coupon good for a sample can of Preserv-O Tire Paint. Only one to each person. Present coupon at your dealer's.**

Dealer's Name .....Name .....

Address .....Address .....

Atlas Auto Supply Co., Chicago.



This is the Republic Rubber Company's New Calender Room

Where machines and brains make tire mileage for YOU

The efficiency of any tire depends to a great extent upon the manner in which the fabric and rubber (the "foundation") are treated and combined.

The illustration above shows the Republic Calender Room—the new "rolling mill" of this rubber plant where foundations for Republic tires are made.

In this great room man's skill and ingenuity and modern machinery combine to make the *right* foundation for Republic Tires. Scientific, painstaking care is exercised in every operation from testing and drying the fabric to calendering ("rolling") the rubber and combining the two under proper heat and pressure.

And on this *right* foundation is put the Staggard Tread—the tread of extra thickness that leaves the full-thickness plain tread after the center studs eventually wear off.

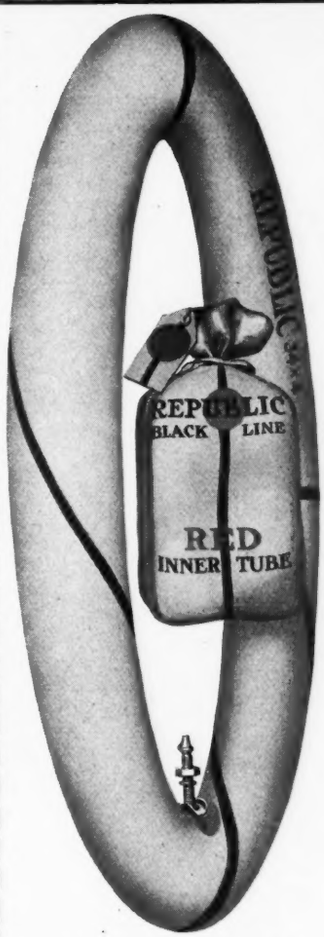
The Staggard Tread is protection against skidding, and really economical because of the extra mileage it gives you.

Write today for beautiful folder on this wonderful new Calender Room.

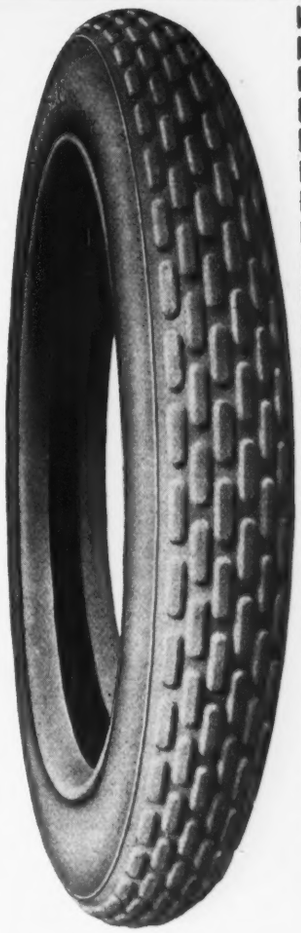
THE REPUBLIC RUBBER COMPANY
YOUNGSTOWN, OHIO
Branches and Agencies in the Principal Cities

REPUBLIC STAGGARD TREAD TIRES

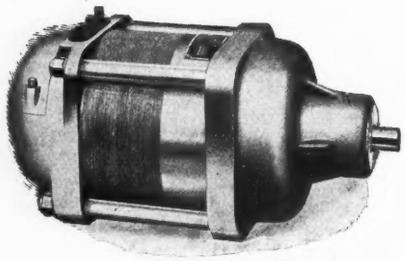
Republic Staggard Tread, Pat. Sept. 15-22, 1908



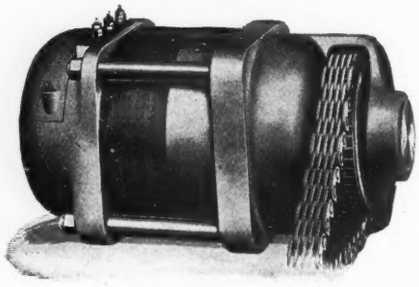
Republic Black-Line Red Inner Tube



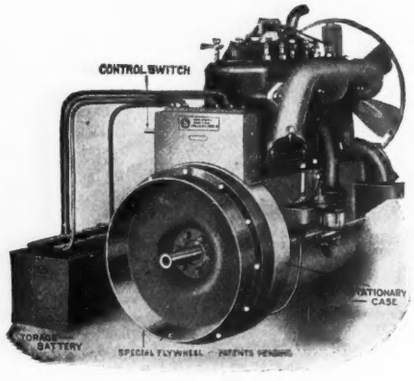
The Original Effective Non-Skid Tire



APLCO Model A6
Electric Engine Starter



APLCO Model A7
Electric Engine Starter



APLCO Flywheel
Engine Starter

APLCO Electric Engine Starters

The Simple and Foolproof Systems

Designed by V. G. Apple, the man who made the first dynamo for an automobile, the first electric lighting system for an automobile and the first electric engine starter (1900).

Not an experiment but a fully developed success.

The Models A-6 and A-7 having withstood a year of severest test in actual service can be depended upon to perform their functions with certainty and absolute reliability.

The Aplco System is not a makeshift.

Not so delicate in construction that the possibility of its not working has to be provided for with elaborate care. It is not necessary to have an army of engineers following these equipments about. The Aplco Electric Engine Starters are as dependable as the engine in your car, and are ready to give service any hour in the twenty-four and in any kind of weather.

Note the Clean Cut Lines of the Aplco Models.

They are three unit systems,—Dynamo-Motor, Controller and Storage Battery. No additional apparatus necessary and they combine in one system every electrical function required on an automobile. Controlled by a system of regulation so simple a child can operate it.

See These Systems at Our New York Store, 20 Vesey Street, During the New York Show—1508 Michigan Avenue, During the Chicago Show.

The Aplco Flywheel Starter

This is the greatest engineering triumph of automobile history. It absolutely eliminates all gearing, clutches and extra bearings. Has just two parts, one attached to your engine crank case, the other bolted to your flywheel. No elaborate changes necessary to install. No complications. Not necessary to make a gear out of your flywheel.

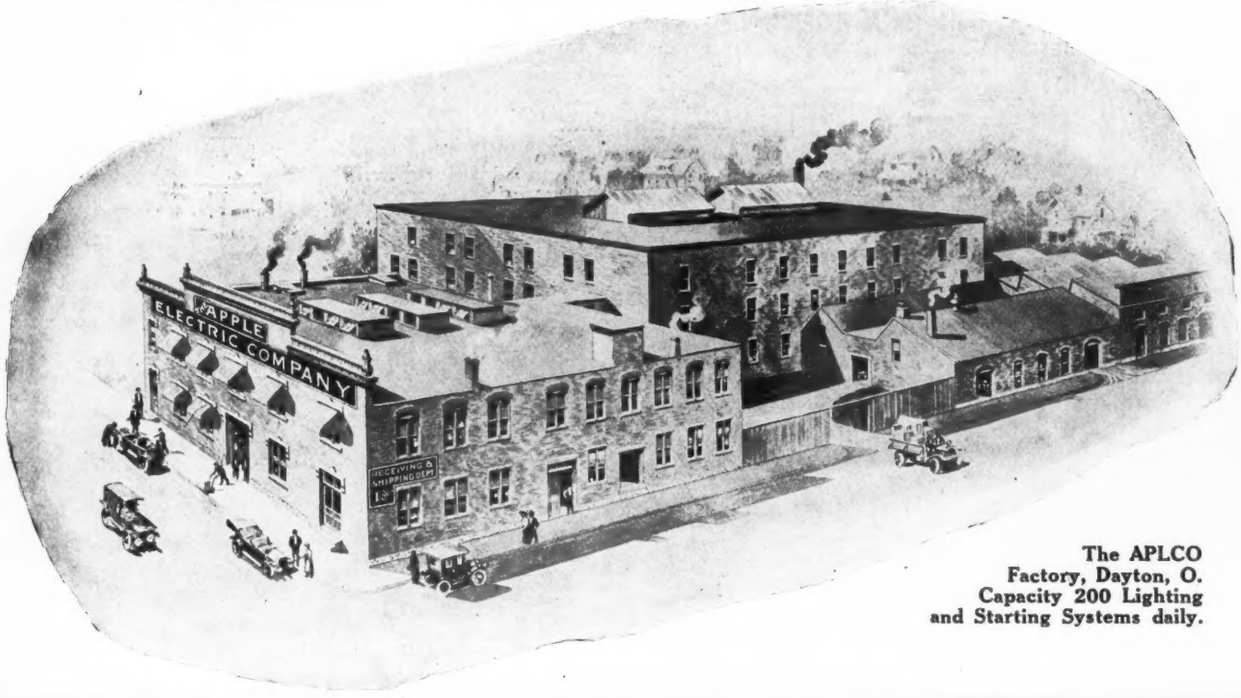
The Apple Electric Company

An Ohio Corporation **Capital $300,000, fully paid**

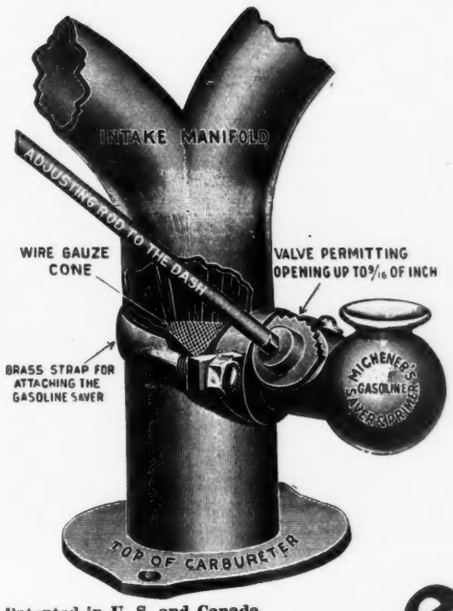
20 Vesey Street, New York **1508 Michigan Ave., Chicago**

Factory and Home Office, Dayton, Ohio, U. S. A.

We are ready for your business



The APLCO Factory, Dayton, O. Capacity 200 Lighting and Starting Systems daily.



Patented in U. S. and Canada

If a man should stand on the street corner and offer to sell silver dollars for seventy-five cents, he could not do business fast enough.

Gasoline at 3/4 Present Cost

If a garage man told you he would sell you 4 gallons at the cost of 3 gallons, you'd sit up and take notice—start to figure out just how big a dent that was going to take out of your gasoline bills for the year.

Here's a proposition—just as generous as the above, only a **real** one—a proposition that hits every motorist in the pocketbook. It takes the wind out of the "high cost of gasoline" and the "increased cost of motoring"—terrific factors which have risen within the last 6 months.

Here it is:—the **MICHENER GASOLINE SAVER & PRIMER!** It will **decrease** your fuel consumption 25% and **increase** your speed. It will absolutely give you 4 gallons of fuel at the cost of 3. It will pay for itself in fuel saved, many times over.

Furthermore—it is an infallible primer, which makes it almost indispensable to the motorist who uses his car during frosty weather. To prime, fill the mixer bowl with gasoline and give the valve a small opening; when you crank, the intake stroke draws the gasoline through the wire gauze cone, converting it into a rich, perfect mixture which ignites instantly. You always have control of the mixture from your seat.

We don't ask you to take **our** word for this. Write us and we will send you testimonial letters from more than half a hundred motorists, operating different makes of cars, who attest that their Michener Gasoline Saver & Primer is the biggest lowerer of upkeep expense today on the market—is the best insurance for easy starting in cold weather obtainable.

Try this device for 30 days, and if it does not prove absolutely satisfactory, **return it and we will immediately refund your money.**

Michener's Chain Carbon Remover

Don't pay a repairman $15.00 to take your motor apart to decarbonize it, thus running the danger of having its delicate economical adjustments disturbed. Invest 75c in a **Michener Chain Carbon Remover.** Simply insert the Chain through a spark-plug hole, inject a little kerosene oil, cut off the ignition from that cylinder and run the engine for two minutes. Your cylinder will be entirely freed from carbon. You can clean two cylinders at the same time, with two Chains.

If your dealer cannot supply you, send us 75c (3 for $2.00) and we will send you—postpaid—the most economical carbon remover today on the market. It will pay 100% dividends in added engine efficiency, in time saved and in garage bills. Guaranteed absolutely harmless to motor. It is 90% copper.

Pat. Apr. 2, 1912

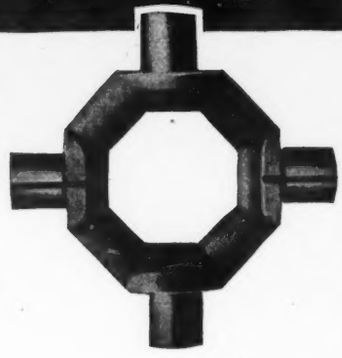
WHEN ORDERING, STATE KIND OF MOTOR

E. S. MICHENER, Washington Street, NEW CASTLE, PA.

Universal Equipment for High Class Cars

Spicer Universal Joints

OIL TIGHT DUST PROOF



"SPICER" Universal Joints are recognized as the Standard for American Cars. There is a reason for SPICER superiority. We have our own Drop Forging Plant and are therefore able to control the quantity of steel in our Drop Forgings. The competent workman and strict inspection standards in our machine department insure a finished product whose accuracy and strength have created the slogan. "SPICER" is Quality.

Spicer Mfg., Co.
Plainfield, N.J., U.S.A.

INTERLOCKS

Double Your Mileage

INTERLOCK INNER-TIRE

Prevent Blow-Outs and Punctures

Save Half Your Tire Expense

If you really believed this you would order a set of Interlocks for your car at once. We can prove our statements if you will give us the opportunity. Thousands of car owners are discarding inner shoes, reliners, fillers, extra treads and other makeshifts for Interlock Inner Tires with the most satisfactory results. A set of new tires equipped with Interlocks will carry your car an entire season without tire trouble. That's a big statement, but we can prove it.

What Interlocks Are Interlock Inner Tires are complete endless inner tires (not inner shoes) quickly and easily placed between the outer casing and the inner tube. They strengthen the outer case and protect the inner tube from punctures. The patented Interlock Flaps lock the Interlock securely making it an integral part of the whole tire that flexes perfectly and cannot chafe, creep or heat. Interlock Inner Tires will hold even if the outer casing is broken, and can be used in old or new tires. They double the mileage of new tires and add 1,000 to 5,000 extra miles to old ones. Interlocks have a fine gray rubber finish, are smooth outside and inside and have no troublesome ends, joints or edges to cement. Interlocks do not affect the resilience of your tires—are easy to insert and can easily be removed from one tire and replaced in another.

Proved Best by Road Tests Interlock Inner Tires are the only tire reinforcement that has stood the exacting test of hard road work. Eight tires equipped with Interlocks have made over 7,000 miles each, a total of 56,000 miles, without a blow-out or any tire trouble. Interlocks used in tires that have gone 10,000 miles with the outer casings worn clear through have kept up with fast cars equipped with new tires and carrying extra tires. Interlocks have made a 4,500 mile cross country run—the last 1,000 miles over 20 mountain ranges without a blow-out or even carrying an extra tire. In the Four States Run Interlocks stood the test of hard fast road work under the critical observation of tire experts, without tire trouble. These and other hard public tests have proved the efficiency of Interlock Inner Tires beyond question.

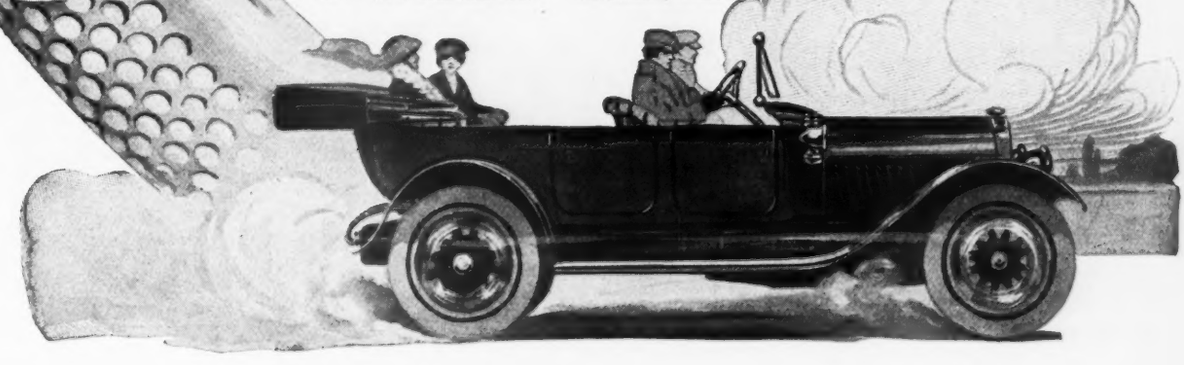
90% Of All Tires Are Scrapped Before The Rubber Tread is Half Worn Out

because the fabric is not strong enough to resist hard road work, resulting in blow-outs, punctures, rim cuts, etc. The liberal excess fabric strength of tires equipped with Interlocks prevents blow-outs, punctures, etc., gives extreme long mileage, safety, and that freedom from tire trouble which every car owner desires.

Are You Open to Conviction?

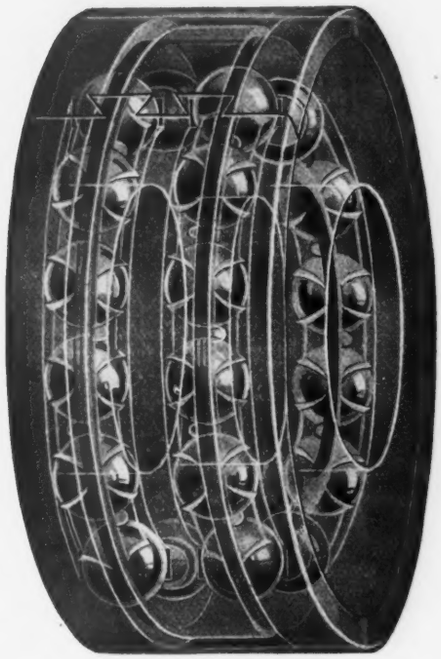
Send us your address on a post card and let us mail you our booklets, data and testimonials of users which are very convincing. Interlocks are sold by the best dealers everywhere. Ask your dealer about them. See our exhibits at New York, Chicago and Boston Shows.

Double Fabric Tire Co.
128 W. 9th Street Auburn, Ind.



BOYER SUSPENSION BEARINGS

Differ from All Others Because Each Ball Carries Its Part of the Load at All Times

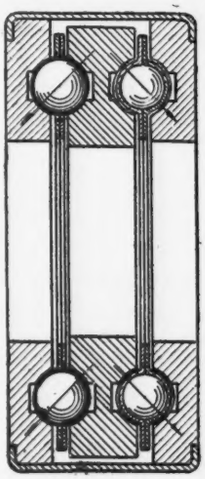


Double Row Suspension Ball Bearing

The remarkable statement conveyed in the above headline instantly challenges the attention of every manufacturer, every engineer and every designer who has to do with the making of motor cars.

It means less friction, and therefore a more perfect transmission of power than is possible with the ordinary type of bearing having unequal load distribution.

It means an end to the crushing of balls as a result of the load falling upon one ball after another as each reaches the lower part of the raceway.



Cross section of a double row Suspension Ball Bearing. The arrows show the angle of load pressure, which is distributed over all the balls in the bearing.

The foregoing advantages will naturally suggest themselves to every engineer, but they only half tell the story of these remarkable bearings.

Boyer Suspension Bearings, by reason of the fact that the axes of their balls have a 45 degree inclination, are—at one and the same time—true Radial and Thrust Bearings.

Boyer Suspension Bearings, because of the manner in which their balls are rotated, *work out* foreign matter between their raceways, instead of imprisoning it and thus creating new causes of friction and wear.

The operation of Boyer Suspension Bearings is so thoroughly out of the ordinary—and yet so logical—that you should read our booklet on the subject, which treats both of single and double row Suspension Bearings.

No manufacturer can afford to ignore this new bearing, which furnishes a complete solution of the most important problems connected with anti-friction bearings. Write for the booklet today.

SUSPENSION ROLLER BEARING CO., Sandusky, Ohio

One Look Locates the Trouble

Lift the hood and look. A single glance, bright day or darkest night, tells the whole story of what's wrong with your ignition when your motor is equipped with J-D Visible Gap Spark Plugs. Hunting around with matches, short circuiting with a screw driver, unscrewing the plugs to examine the points—all that fuss and loss of time are needless.

$1.00 JEFFERY-DEWITT CO. DETROIT, MICH. **J-D Visible Gap Spark Plugs**

See how simple the secret of their efficiency is. In the porcelain —outside the motor—is an opening or port. In the portion of the central electrode and facing this port is an adjustable gap, regulated by knurled nut at the cap so that it can be widened or closed entirely. Through this port you see if the spark is jumping the gap in the electrode. If there is no spark at the gap, you know trouble lies behind in wiring, magneto, coil or batteries. If the spark jumps but proper ignition fails to follow, then the points must be fouled or carburetion is faulty. By widening the gap you can increase intensity of spark and scour the points clean through the J-D patented electrical action found in no other plug.

There are other services this plug can render. It facilitates timing of engine, regulates spark for any cylinder and uses minimum current.

Yet the Price Is Only $1.00

If your dealer can not supply you, we will mail as many as you want prepaid on receipt of price. Our guarantee "Your money back or a new plug unless you are absolutely satisfied," goes with every plug.

When ordering by mail, be sure to give the size wanted or make of motor.

JEFFERY-DEWITT COMPANY

551 Butler Avenue **Detroit, Michigan**

Largest manufacturers of Spark Plugs in the World

The New TRADE K-W MARK ELECTRIC HEAD LIGHT OUTFIT $35.00

Complete Electric Headlights
FOR FORD CARS
With Fly-Wheel Magneto **$15.00**

The successor to the gas tank. Current direct from Magneto.

The **K-W** Outfits manufactured for this purpose are not makeshifts, but are complete in every detail.

The Outfit Complete, which is all you need, consists of

1 pair complete Head Lamps.
2 Tungsten bulbs, 2-1/16" in diameter.
12 feet wire, all soldered to lamps.
1 Lighting Switch.
Instruction Sheet for Wiring.

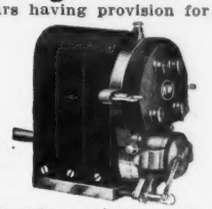
The Lamps are made entirely of one piece of brass drawn from steel dies; have no soldered joints, easy to polish, and make a handsome lamp for the Ford cars. They fit the forks furnished on the Ford cars.

For Black finish add $1.00.

The chief value in an Electric Head Lamp is a perfect reflector. The K-W Reflector is a **reflecting lens,** optically figured out by one of the foremost optical and lighting engineers of the country, after a long series of experiments. Let us send you booklet explaining why the K-W Reflector excels all others.

The K-W High-Tension Magneto
For all cars having provision for Magneto

Model J Guaranteed to Start Auto Engines up to 30 H. P.



No Coil
No Timer
No Batteries
4 Cyl., $50
6 Cyl., $55

We make larger Magnetos for larger engines. High Tension Magnetos are for Ignition use only. Use Low Tension for lights.

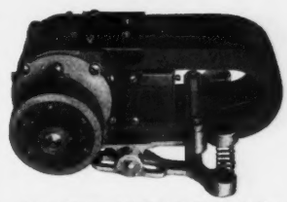
If you cannot gear-drive a High-Tension Magneto, use one of our Low Tension belt or friction-drive Magnetos and a K-W Spark Coil.

Complete Outfit; alternating current generator, headlamps, switch, wire and bulbs.

Easy to install on any car with exposed fly-wheel. No storage battery required. No complicated cut-out nor charging device.

CURRENT DIRECT FROM GENERATOR.

Weight only 18 lbs. Compare this with the heavy, complicated and costly charging outfits.



The New Model LS Lighting Generator, $20.00.

This Generator embodies the well-known K-W construction, having no commutator, no brushes, and no sliding contacts, the only moving part being the rotor, which swings perfectly free, supported on high duty ball bearings.

The Model LS K-W Generator has one magnet less than our regular Model UL $35.00 Magneto, and is just like it in every way except that the Model LS is slightly smaller. Model LS will light two 2½-Ampere bulbs (two sixteen candle power bulbs).

FOR IGNITION.—This Generator can be used in place of batteries for ignition if you have timer and spark coil.

The K-W Spark Coil

Single Cylinder	$12.00
2-Cylinder	18.00
4-Cylinder	30.00
6-Cylinder	42.00
Marine Coils	$6.00 and $7.00

32,000 FORD OWNERS NOW USE
The K-W MASTER VIBRATOR. Why?

Because the Master Vibrator does a great deal more than simply replace the four separate vibrators on a coil.

It is **NOT A VIBRATOR** in the ordinary sense, but a scientifically constructed **MAGNETIC CIRCUIT BREAKER** which times the spark more accurately than the ordinary High Tension Magneto.

It is so designed as to utilize the alternating current of the Ford Magneto and make the coil produce a **MUCH HOTTER SPARK** than it could produce with any other vibrator.

No matter what coil you now have, whether it has four vibrators or one, **THE K-W MASTER VIBRATOR** will give you:

A HOTTER SPARK, preventing sooty plugs and carbonizing.
EASY STARTING, due to the hotter spark.
MORE POWER. It makes the hills "Fade Away."
LARGER CONTACT POINTS and handsome switch.
INCREASED SATISFACTION with your car.
EASILY PUT ON IN HALF AN HOUR, no changes in car necessary.

OUR GUARANTEE.—If you ever feel that you can get along without it, return it within 30 days. Money back and no questions asked.

PRICE, $15.00. Express prepaid if cash accompanies the order.

BE SURE TO GET TRADE K-W MARK AND HAVE THAT SATISFIED FEELING

There is only one genuine time-tested and guaranteed Master Vibrator. The scientifically constructed Magnetic Circuit Breaker on the K-W Master Vibrator, when used with the Ford Magneto, will give as good results as an ordinary High Tension Magneto.

We make a complete line of ignition apparatus.

Don't simply ask for Catalogue —Tell us your troubles and we will help you.

THE TRADE K-W MARK IGNITION Co.
2835 Chester Ave. CLEVELAND, OHIO. U.S.A.

WE PAY THE EXPRESS East of the Mississippi River or to the Mississippi on points beyond on any of our goods, when cash accompanies the order.

We'll exhibit a complete line of vulcanizers for motorists and garages. Booth 237, Balcony, January 11—18

Something brand new that every motorist needs.

A REAL Shaler Vulcanizer for only two dollars. A vulcanizer that will make tube repairs equal to those made by the most elaborate plant. Anybody can use it on the road or in the garage without experience. Made by the largest vulcanizer manufacturers in this country, by men who know the requirements of such an appliance.

Don't ever use another unreliable cemented patch. Make permanent repairs with the quick-cure Vul-Kit.

VULCANIZER REPAIR KIT—little brother to the SHALER

Eliminates delay and repair bills. Makes your repairs when you want them at a tenth of the expense you've been accustomed to.

The only low priced vulcanizer that actually **vulcanizes** a tube repair clear through because it generates its fuel, gasoline, into a gas and distributes the flame all over the vulcanizing surface. This causes the vulcanizing temperature to be **maintained** long enough to cure the repair. A gradual heating and cooling only results in a superficial cure—**does not vulcanize.**

Other exclusive features show the only improvements made since the first crude gasoline heated repair kit was marketed.

A universal clamping device insures the equal pressure that makes smooth, uniform repairs. An asbestos pad, inlaid in the plate on which tubes are repaired, retains the heat and prevents pinching the tube. Handle—always cool — permits vulcanizer to be removed from tube while hot.

No complication about it. Everything automatic. Simply fill the puncture with raw rubber, clamp down the vulcanizer, fill the generator and light it. The repair will be perfect and outlast the tire.

Furnished with a supply of repair material and full instructions. Nickel-plated—will last a lifetime.

A real SHALER VULCANIZER $2

Motorists: Write today for a free copy of Care and Repair of Tires, a booklet that is full of valuable tire saving ideas. Contains full description of Shaler Vulcanizers.

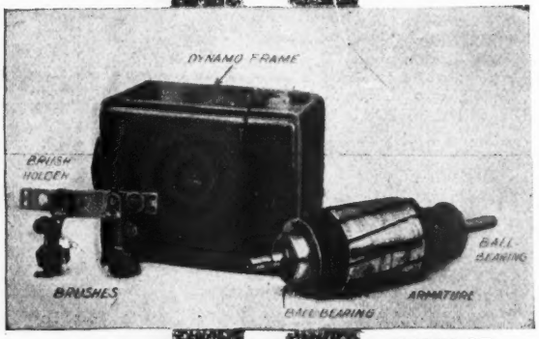
Dealers: Shaler Vulcanizers will bring in the profits. Get our 1913 Trade Proposition. It's a startler.

C. A. SHALER CO.

201 Tenth St. Waupun, Wis.

MANUFACTURERS OF THE ONLY COMPLETE LINE OF VULCANIZERS IN THE WORLD

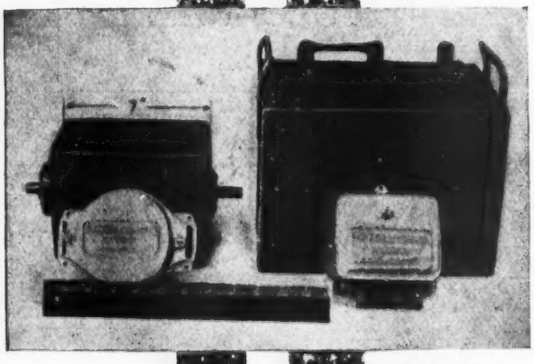
The WARD LEONARD System
for Lighting and Starting
Every Trial a Triumph



PARTS OF LIGHTING DYNAMO

WARD LEONARD

Lighting - Starting



COMPLETE EQUIPMENT FOR LIGHTING SYSTEM

106

Every trial of a Ward Leonard System means triumph for its designers and satisfaction for its users.

Every user—every dealer—every manufacturer realizes the need of an efficient lighting and starting system.

But each one of them wants the ultimate system, and the ultimate system will be that one which is theoretically, scientifically and practically correct.

There must be no complications, no unnecessary parts, nothing to get out of order.

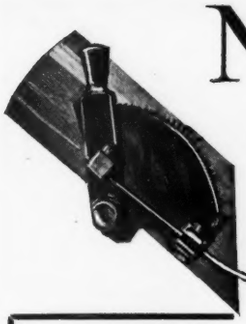
The system that will answer these requirements is the Ward Leonard System.

Time and exhaustive experiments through twenty years of electrical experience have shown that the Ward Leonard System is perfect.

We realized years ago that the value of an electric lighting and starting system to the automobile manufacturer lay in the perfection of its automatic control. Our perfection of this feature stamps the Ward Leonard System as the ultimate choice of engineers.

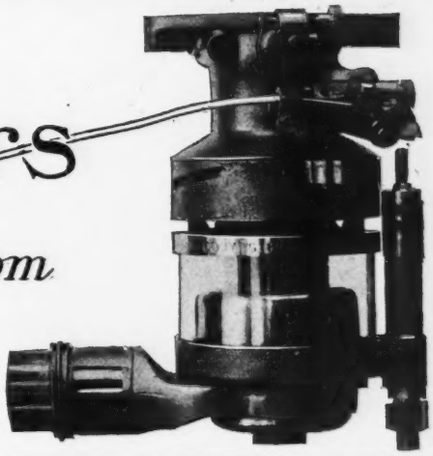
WARD LEONARD ELECTRIC CO.
BRONXVILLE N. Y.

WARD LEONARD



New-Miller Carburetors

"Adjusted *from* The Seat"



Your Automobile Is No Better Than Its Carburetor!

No matter how finely equipped—no matter what the rated speed—no matter what the other mechanical details—the entire efficiency of your motor depends upon the carburetion. Don't blame your engine—or other working parts—until you are sure the trouble isn't in the carburetor. There is but one carburetor made to give maximum power and proper mixture at low speed as well as high. That is the best carburetor you can use in your car. It is the

New-Miller Carburetor

Try it out. If it isn't just as far above other carburetors—doesn't give you just as much better service—just as much saving of fuel as we claim—we are the losers.

Here are a few of its individual features that make it the best of all carburetors for your use.

New-Miller Carburetors are mechanically operated, the slightest movement of the throttle giving a positive movement to the auxiliary air and needle.

Once adjusted on your motor for low, intermediate and high, they never need another adjustment, taking care of weather conditions and variable grades of gasolene by a convenient control.

Besides being mechanically operated they are proportioned mechanically, all parts being manufactured to a standard on specially designed machinery, making every unit interchangeable.

By their control, admitting air as desired, they may be throttled low and save you enough fuel to pay for the carburetor itself in a season's use.

We have prepared a new Carburetor Book, giving the inside facts of carburetors—telling just how the New-Miller is made—giving complete details throughout.

It will pay you to send in the coupon below and get this information today.

Owners and Dealers are requested to see our Factory Representatives at Elevated Platform, Space 150, Madison Square Garden, New York Automobile Show or Space 130-131, Coliseum Annex, Chicago Automobile Show.

New-Miller Carburetor Company, 514 N. Capitol Ave. Indianapolis, Ind.

Territory for live dealers open. Apply to us or nearest representative:

E. J. Edmonds Co., ...1783 Broadway, New York
Smith Bros.-Ellis .....311 W. Pico, Los Angeles, Cal.
Bertram Motor Car Co.....Salt Lake City, Utah
B. Gerdelman Mfg. Co.4614 Washington Blvd., St. Louis, Mo.
L. C. Speers.....518 Grand River Ave., Detroit, Mich.
Van Camp Hardware & Iron Co.....Indianapolis, Ind.

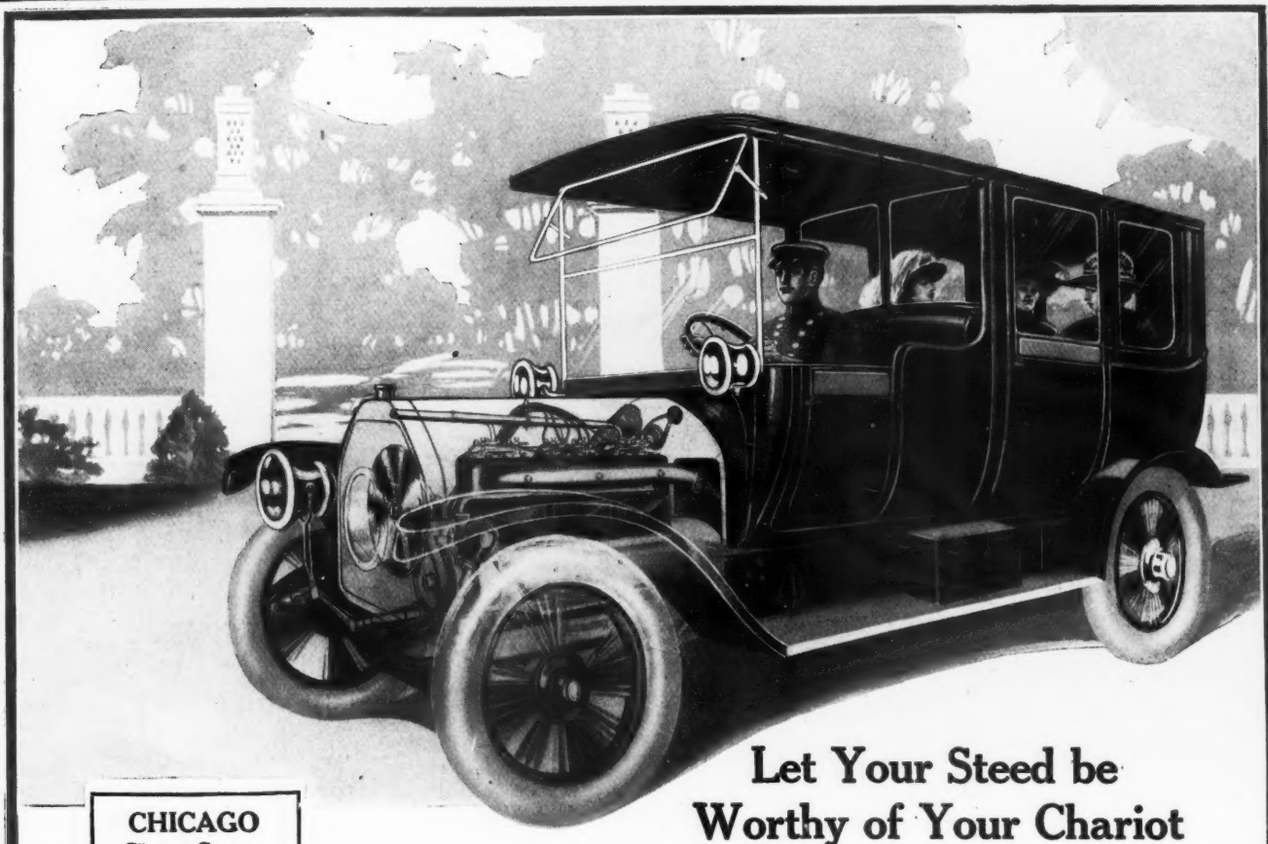
NEW-MILLER CARBURETOR CO.,
514 N. Capitol Ave., Indianapolis, Ind.
Gentlemen:
Send me your descriptive Catalogue.

My car is .....

Manifold is .....inches.....

Name .....

Address .....



Let Your Steed be Worthy of Your Chariot

CHICAGO Show Space
North Coliseum Gallery

MOST automobile buyers select their first car because of its appearance. In making their second purchase they inspect the chassis even more critically than the body. If you are building automobiles for repeat sales you must install a motor that is consistent with the quality of your car, one that will appeal to and satisfy the most experienced motorist.

THE RUTENBER MOTOR

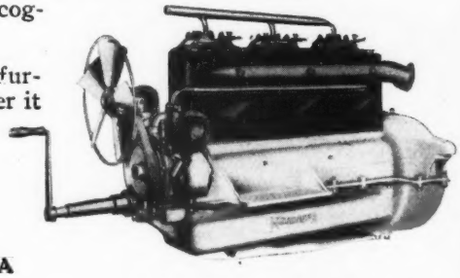
is such a motor. No matter whether it be for the handsomest limousine or for the most powerful truck, for the racing car or for the light delivery wagon, for the roadster or the touring car, the Rutenber Motor offers the assurance of consistent service, dependability and economy of maintenance. It is honest, substantial, powerful and silent. It has plenty of speed, endurance and reserve energy. It has established its own reputation and has won recognition for many a car.

When competition is keenest the Rutenber Motor furnishes the argument that clinches the sale. Thereafter it gives the service that insures reorders and extends the reputation of your car.

Write for the Rutenber Book.

RUTENBER MOTOR COMPANY

MARION **INDIANA**



Model 28 Unit. Valve Side

"Look! Look at That!"

Weed Chains would have prevented that accident

"Did you see that car skid? Look at the way she is all smashed up. It will cost a couple hundred dollars to repair the damage. Lucky those women weren't badly hurt.

"I suppose that fellow at the wheel will have "nerve enough" to say he couldn't help it—that it wasn't his fault.

"I want to say to you that ***any man*** who attempts to drive his car without Weed Chains, when the roads or pavements are slippery and uncertain, or covered with snow—is ***next to criminal.***"

Every motorist knows that Weed Chains can be relied upon to absolutely prevent skidding under every road condition—*then* if he neglects to use them, how can he possibly get away from his own responsibility?

Weed ANTI-SKID Chains

Prevent accidents—Eliminate all possibility of skidding

No one may properly be called an efficient and safe driver of a motor car unless he has, at all times, complete control over the machine he is driving. No one driving over a slippery road has complete control of a motor car with wheels equipped with nothing but ordinary rubber tires. When equipped with **WEED CHAINS, *such a thing as skidding will not be possible.***

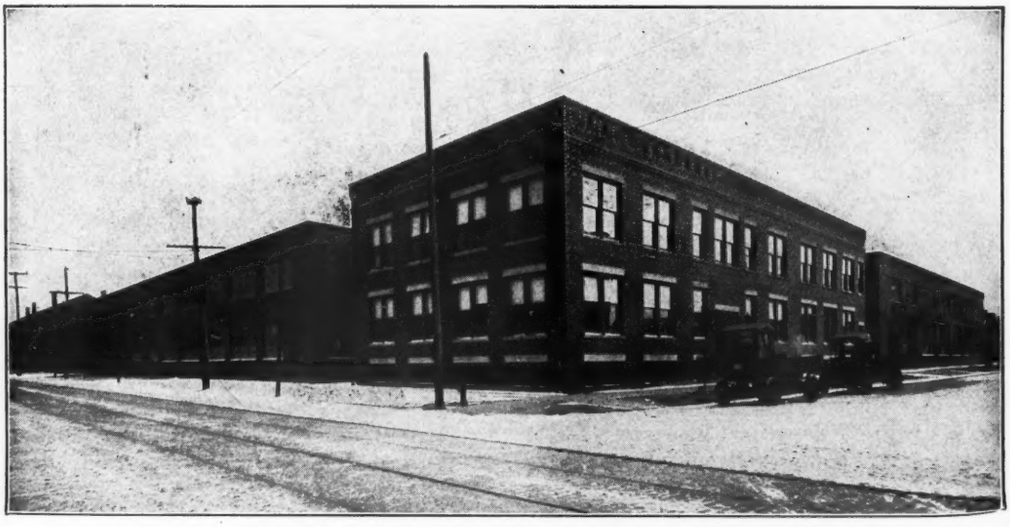
Are you still taking your life in your hands by refusing to take even the ordinary precaution against skidding? Are you still depending on rubber alone for your own safety, the safety of your passengers and other road users?

If you haven't a set of **WEED CHAINS,** or if you have a pair for your rear wheels only, get a full equipment now. Delay is dangerous. Stop in at your dealer's and provide yourself with ***the kind of life insurance that saves lives.***

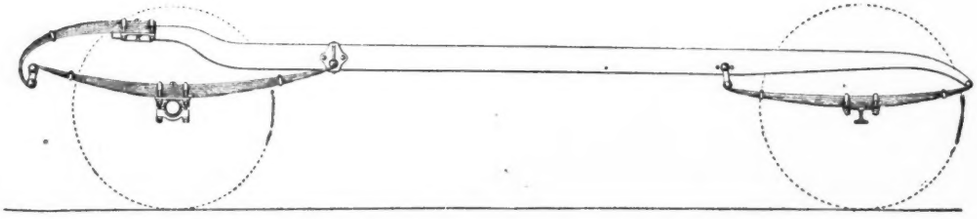
For sale by all reputable dealers

Weed Chain Tire Grip Co., 28 Moore Street, New York

Location at New York Show: Grand Central Palace, Booth No. 427 Madison Square Garden, Booth No. 142
Chicago Show: Booth No. 14 ***Boston Show:*** Booth No. F-554



The Largest Exclusive Automobile Spring Factory in the World
Our Plants Cover Three and One-Half Acres.



Our Thin Leaf Pleasure Car Springs, Made from the Best American and Imported Krupp Silico Manganese Steels, are the Easiest Riding and Most Durable Made

The Perfection Spring Company

Main Office and Plant No. 2,
Central Ave. and E. 65th St.,
Cleveland, Ohio

WE EXHIBIT AT THE NEW YORK AND CHICAGO SHOWS

Everything Electrical for Automobiles

The well known and complete line of ignition devices manufactured by the Pittsfield Spark Coil Company is now marketed by the Western Electric Company under the name of

Western-Electric PITTSFIELD

In this exclusive sales agreement the Western Electric Company —with its reputation as the maker of all the "Bell" telephones and as the distributor of high quality electrical products — endorses the entire Pittsfield line, including

Magnetos
Porcelain Spark Plugs
Mica Spark Plugs
Spark Coils
Switches
Timers

The great distributing organization of the Western Electric Company, with its twenty-eight sales offices and several hundred salesmen, is at the service of the automobile trade.

Complete stocks carried at all houses put this line of ignition devices within over-night shipment of every automobile manufacturer, dealer and owner.

The entire line exhibited and demonstrated in the Western Electric Pittsfield booth at the New York Automobile Show, Madison Square Garden.

MANUFACTURED BY

PITTSFIELD SPARK COIL COMPANY

DISTRIBUTED EXCLUSIVELY BY

WESTERN ELECTRIC COMPANY

New York	Richmond	Milwaukee	Indianapolis	Minneapolis	Salt Lake City	Dallas
Buffalo	Atlanta	Pittsburgh	St. Louis	St. Paul	San Francisco	Houston
Philadelphia	Savannah	Cleveland	Kansas City	Denver	Oakland	Seattle
Boston	Chicago	Cincinnati	Oklahoma City	Omaha	Los Angeles	Portland

Equipment for Every Electrical Need

Prest-O-Starter

Starts your engine (old or new) quickly and easily in coldest weather

For Four Cylinders $20

For Six Cylinders $25

$1.50 extra for two-way valve necessary when the same Prest-O-Lite is used for both starting and lighting.

Here's a starter that adds practically no weight to your car, is perfectly simple and is as durable as the engine itself. Easily applied to any engine, old or new, very economical in the use of gas, and requires no expert repairing.

How Prest-O-Starter Works

The principle of starting a motor with Prest-O-Starter is the same as "starting on compression." A measure of acetylene, at low pressure, is pumped from your Prest-O-Lite into the cylinders.

Touch your spark—your engine starts.

Unlike "gasoline priming," it is not affected by heat or cold. It is certain.

In cool weather, by opening a valve on the dash, you can feed gas at low pressure into the intake manifold. This allows your engine to run on acetylene until it is warm enough to run on gasoline.

If the Prest-O-Starter did no more than prime your engine in this way during cold weather, this convenience would be well worth the price.

But Prest-O-Starter is more than a primer. When installed properly, it will start your engine, summer or winter, almost invariably without recourse to the crank.

Make Sure Your Starter Is Installed CORRECTLY—Look It Over!

The Prest-O-Starter is easy to install correctly. In fact, it's so very easy to install that some good factories and garages install it with utter carelessness, overlooking the one or two simple features vital to success in operation. Fortunately this is an easy matter for the car owner to correct, even if he isn't a mechanic.

Our literature tells you exactly how the Prest-O-Starter is installed, and how to adjust it. Anyone can give it the slight attention it may need or quickly tell a dealer where the trouble lies.

Every Prest-O-Starter is sold with the assurance of satisfactory service. The entire Prest-O-Lite Organization is back of every one. If you have any trouble, report it to us or to our nearest branch. We'll wipe it out quickly.

Insist Upon GETTING the Outfit COMPLETE

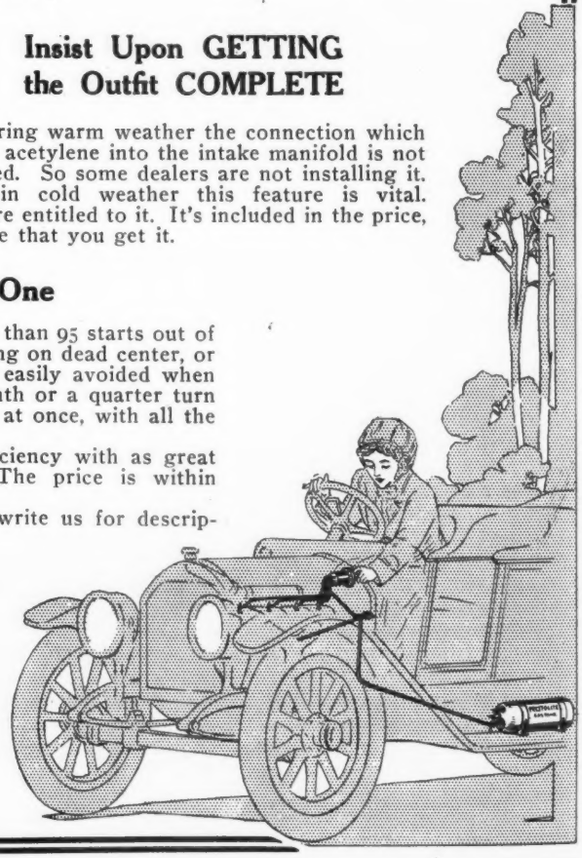
During warm weather the connection which feeds acetylene into the intake manifold is not needed. So some dealers are not installing it. But in cold weather this feature is vital. You're entitled to it. It's included in the price, so see that you get it.

Now—More Than Ever—You Need One

Your Prest-O-Starter, properly installed, will average better than 95 starts out of 100 attempts. The few failures are caused by your motor stopping on dead center, or cylinders filled with burnt gas. Both of these conditions can be easily avoided when stopping your motor. But should either or both happen, an eighth or a quarter turn of the crank, with the switch at neutral, will remedy the trouble at once, with all the danger and labor of cranking eliminated.

Rest assured that no other starter can give you as high efficiency with as great economy, durability and freedom from mechanical trouble. The price is within easy reach.

Get in touch with any of our branches—or your dealer—or write us for descriptive literature.



The Prest-O-Lite Co. 233 E. South St. Indianapolis, Ind.

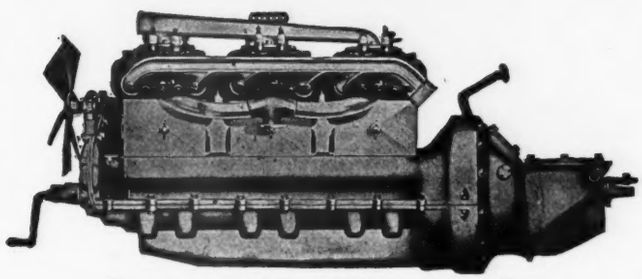
Canadian General Office and Factory, Merritton, Ont.

BRANCHES:

Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Los Angeles, Memphis, Tenn.; Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburg, Portland, Ore.; Providence, St. Louis, St. Paul, Minn.; San Antonio, San Francisco, Seattle, Syracuse, Merritton, Ont.; Winnipeg, Manitoba.

Exchange Agencies Everywhere

Does your car carry a BEAVER or just a motor?



Beaver 40-45 H. P., 6-Cylinder Power Unit

THERE'S a difference! Beaver Six Cylinder Unit Power Plants have over 5 years' six-cylinder manufacturing experience built *into* them. They are exactly 5 years past the stage of experiment—come to car manufacturers proved by the *test of time* emphatically right.

They represent up to the date of shipment all that is known about six-cylinder motor construction, combine every approved principle of design and theory available to masterful engineers who through long acquaintanceship, know the ins and outs of six-cylinder manufacture like a Primer.

Beaver Motors Make Their Way by the Way They Are Made

The BEAVER "Six" is noiseless, vibrationless, oil and dust-tight.

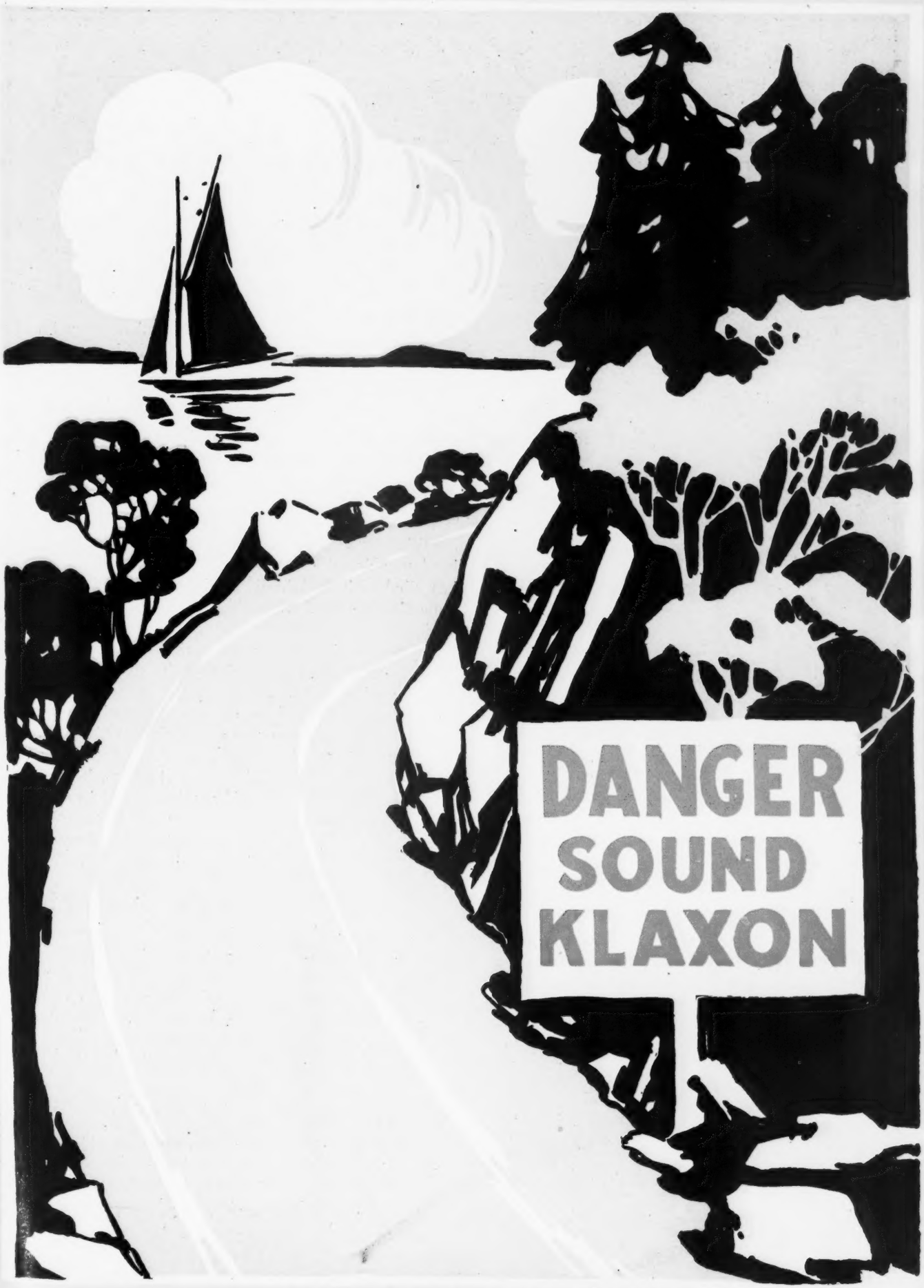
A few of its invaluable 1913 features are: Long stroke ($3\frac{3}{4}$ x 5); 3-point suspension; power plant one rigid unit, short, compact and immune to all torsional stresses; large valves with enclosed action; 3-speed transmission; circulating oil system; simple straight line manifold; concealed water circulation; simple center control; clutch pedal may be mounted on either right or left hand; oil pump integral with lower half of crank case which may be dropped as a unit; fly-wheel enclosed in a continuation of crank case, support arms integral; transmission case in one piece bolted direct to fly-wheel case; large hand hole in fly-wheel case for clutch adjustments, etc., etc.

Write for Detailed Specifications and Delivery Schedule

Made by the Oldest and Largest Builders of 6-cylinder Motors in the United States

Beaver Manufacturing Company

2500 First Avenue **Milwaukee, Wisconsin**


DANGER
SOUND
KLAXON

Airease

THE INVENTOR OF AIREASE DRAWN FROM TELEGRAPHIC DESCRIPTION

"Progress" Is the New American Religion

The man who invented pneumatic tires conferred a great boon on humanity in general and the motoring industry in particular. He showed us the possibilities of riding smoothly, but at great expense. The inventor of AIREASE, in true American fashion, has brought out a product that is just as smooth and easy riding as the pneumatic tire, with the added advantage that it is indestructible and economical.

This is certainly progress, because the tire problem is the most baffling one in all the motoring industry.

Consider the following facts, and see why AIREASE means an end to every conceivable tire ailment:

1. Inner tubes filled with AIREASE won't rot or lose their resiliency no matter how hard you drive.

2. Inner tubes filled with AIREASE are interchangeable and can be transferred from one shoe to another.

3. AIREASE is the one satisfactory tire filler because it is the only product of its kind so compounded and so made that its resiliency and its life will not leak or ooze away, will not harden or dry up, will not decompose with age or rot the rubber tube.

4. AIREASE is the invention of a famous chemist who has investigated for years in an attempt to discover a product that would be as resilient as compressed air and as durable as steel. That he has found it is amply proved by the thousands of tires in use. Today users wonder how they ever got along without AIREASE.

The AIREASER Kids air a neighborhood scandal

Our Guarantee

We guarantee Airease to be absolutely free from all elements that can destroy inner tubes.

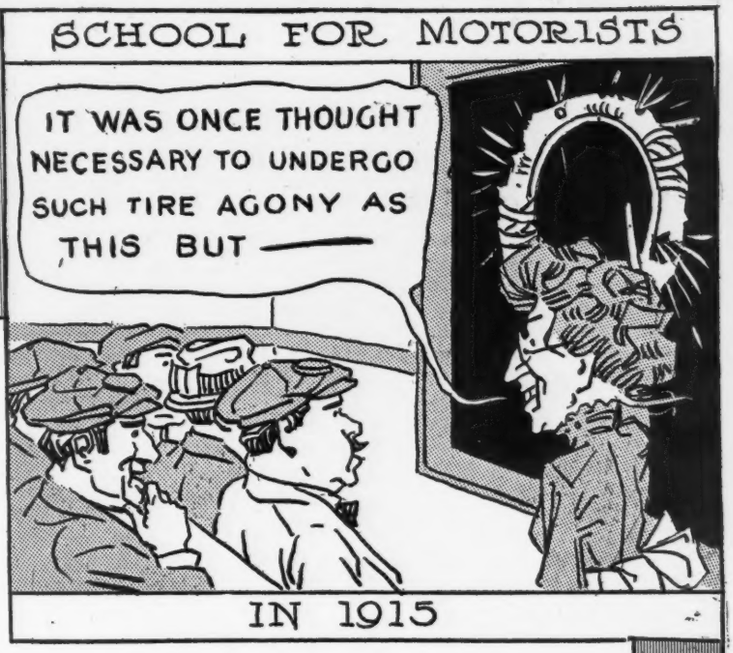
We offer any motorist who claims that Airease has injured his tires a complete new set of inner tubes. We can do this because we know that we are offering a product entirely different from the ordinary run of tire fillers.

This is certainly one step further than the customary worthless guarantee against punctures which accompanies the sale of the inferior tire fillers.

Give us a chance to make it good.

SEE POOR DOUBTING

The Joy of motoring is assured when your tires are filled with Airease. Are you an Aireaser?



DEALERS, you have a beautiful opportunity to bring joy to the heart of every one of your patrons, and record-breaking profits to your purse by proclaiming the gospel of AIREASE!

Every wide-awake automobile accessory salesman is aware of the possibilities which spring from handling a product that positively has banished tire troubles. Punctures, blow-outs and rim-cuts are no longer necessary evils. They are luxuries indulged in only by the antiquated motorist who insists that pneumatic tires furnish the only means of covering automobile wheels.

Under actual road tests inner tubes filled with AIREASE have been used for three years without losing a particle of their resiliency and durability. These same tubes can be taken from one shoe and transferred to another easily and quickly.

AIREASE is practically indestructible and inner tubes filled with it will last as long as any car, giving smooth, easy-riding and complete freedom from tire troubles.

DEALERS, HERE IS YOUR CHANCE TO BUILD UP AN ACCESSORY TRADE that will be profitable no matter how many automobiles are being sold or how tight money may be.

Once a motorist is made familiar with the advantages of AIREASE, he will be as unwilling to do without it as he would be to dispense with the car that he drives.

Don't let the other fellow increase his business many times simply because you haven't had the foresight to get AIREASE territory while it was to be had.

Write us today for the greatest money-making proposition that was ever offered to an automobile dealer.

AIREASE TIRE FILLER COMPANY

Cor. 14th and Pennsylvania Ave., Washington, D. C.

Just the Thing for Electrics!

Economy and convenience are the arguments which induced you to buy an electric.

But your economy is a fairy tale, and the convenience of operating an electric is a myth, if you are constantly bothered with tire troubles.

The batteries alone in an electric are heavy enough to impose a terrific strain on tires without the rest of the car. Are you letting pneumatic tires carry the burden, or have you thought of solid tire equipment? On the one hand, you have constant punctures, blow-outs and rim-cuts, and on the other you have incessant and permanent injury to the working parts of your car, because of the inability of solid treads to absorb jolts and jars.

Adopt the golden mean — USE AIREASE.

Tubes filled with this wonderful tire filler will outlive your car and supply the easiest riding you ever experienced while they last.

The use of AIREASE is the only real tire economy ever offered to motorists. AIREASE is a marvel of composition and manufacture. Its resiliency cannot escape from the tube or leak out, and it will not alter its character in many years of service.

A demonstration means conviction—LET US SHOW YOU!

Our Guarantee Is Iron-bound— Read It

MARK WITH X PROPOSITION YOU ARE INTERESTED IN

M. A. 1-9-13

AIREASE TIRE FILLER COMPANY, Washington, D. C.

Gentlemen:

☐ I am interested in tire filling and desire to know the cost of filling my tires. Front size, ... rear size, ...

☐ I am interested in Airease. Please furnish me cost of filling plant for this territory.

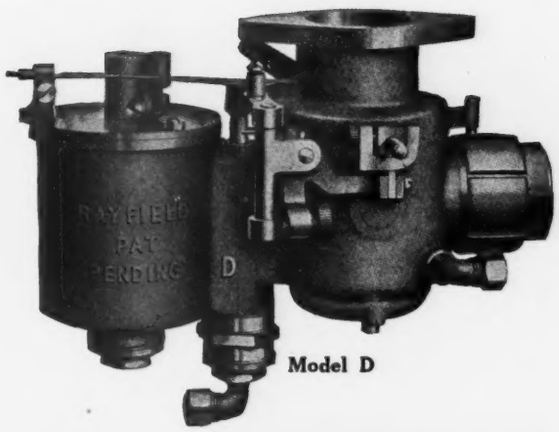
Name .....

Street .....

City .....

THOMAS IN NEXT ISSUE

778



Model D

RAYFIELD Carburetors

Will Be Exhibited At All the Automobile Shows This Season

During your attendance at the show investigate the RAYFIELD Carburetor—look carefully into its construction—you will ***learn why*** it has become famous in such a short time.

You will ***learn why*** it won the Grand Prix, the Vanderbilt Cup two years in succession, the Savannah Trophy—every other leading 1912 race event throughout the country—why it holds more WORLD'S RECORDS than all other carburetors COMBINED!

You will also ***learn why*** the RAYFIELD is not only the carburetor for greatest speed, but also for highest ECONOMY and EFFICIENCY.

WINTER OR SUMMER, RAIN OR SHINE, HIGH OR LOW ALTITUDE, the RAYFIELD PROVES ITS SUPERIORITY.

At New York, Chicago and other shows our most competent men will be in attendance.

What they tell you, and what they show you, will surely be interesting and profitable to everyone interested in PERFECT CARBURETION.

You are invited to call and receive all necessary information.

NEW YORK SHOW—January 11-25
Concert Hall, Madison Square Garden, Space 311

CHICAGO SHOW—February 1-15
Coliseum Annex, Spaces 114-116

FINDEISEN & KROPF MFG. COMPANY

21st and Rockwell Streets, **CHICAGO, ILLINOIS**

BRANCHES:

1140 Michigan Avenue, Chicago. 997 Woodward Avenue, Detroit, Mich. New York City.

Distributors In All Leading Cities

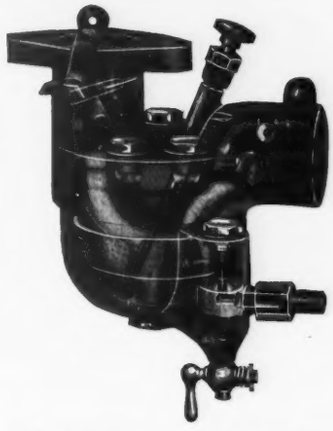
KINGSTON

A 1913 Carburetor *for* 1913 Cars

Present day *low-proof* gasoline demands a *high-proof* carburetor to take care of it. Carburetor manufacturers have had to vary from the principles which formerly governed construction when high-test gasoline was the rule rather than the exception.

The New Kingston Model Y Carburetor Is Designed to Meet New and Urgent Conditions

It is designed to handle *all grades of gasoline* with the utmost *efficiency* and *economy*. In principle, design and construction it is distinctly different from any leading make of carburetor. All the air entering the carburetor is taken from a common source, the air inlet being located so as to make it very simple and convenient to attach fittings for the conducting of warm air to this intake point.



Owing to its unusual construction and the resultant air action produced thereby, a thoroughly atomized spray is produced, which causes the constant supply of air which passes directly over the spray nozzle—and the supplemental air supply (for higher motor speeds) which enters the mixing chamber of the carburetor through the bronze ball regulated valves (controlled by motor suction) to become thoroughly impregnated with gasoline vapor.

In the top or body casting of the carburetor, the openings and areas thereof are so arranged that the effect produced shows the same action as an "Automatic expanding venturi," which positively insures a thorough saturation of all air and gasoline in the proper proportions (controlled automatically) to produce a perfect mixture before leaving the carburetor.

The design includes a special provision for *easy starting*. In addition to the choke throttle, placed in the air inlet, which, when closed, produces a very strong suction or vacuum on the spray nozzle, causing a very rich mixture to be drawn, a "well" is placed around the spray nozzle which supplies an automatic reserve for starting. The design of the gasoline bowl is such that it affords a generous water and sediment pocket—a very necessary feature.

Write for Catalog

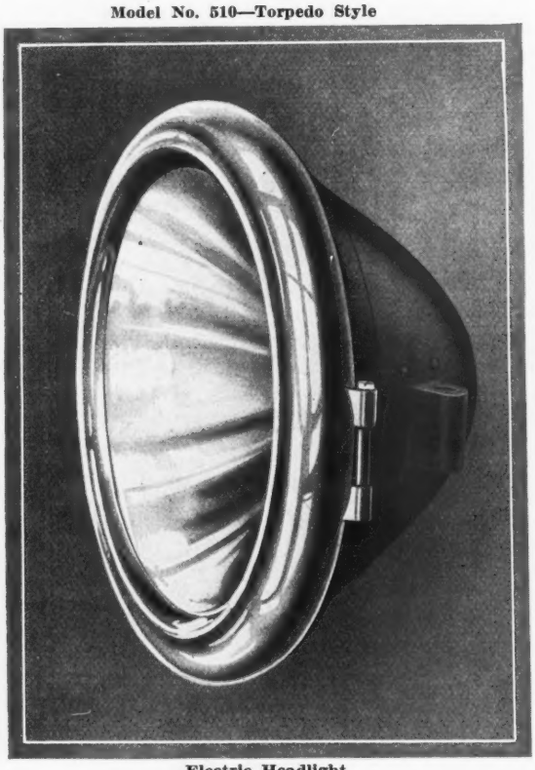
See our exhibits at the New York Show, Madison Square Garden, Space 173, and at the Chicago Show, Coliseum, Space No. 78.

BYRNE, KINGSTON & COMPANY, KOKOMO, INDIANA

BRANCHES:

CHICAGO	1430 Michigan Avenue	NEW YORK	1733 Broadway
DETROIT	650 Woodward Avenue	LOS ANGELES	804 So. Olive Street

Model No. 510—Torpedo Style

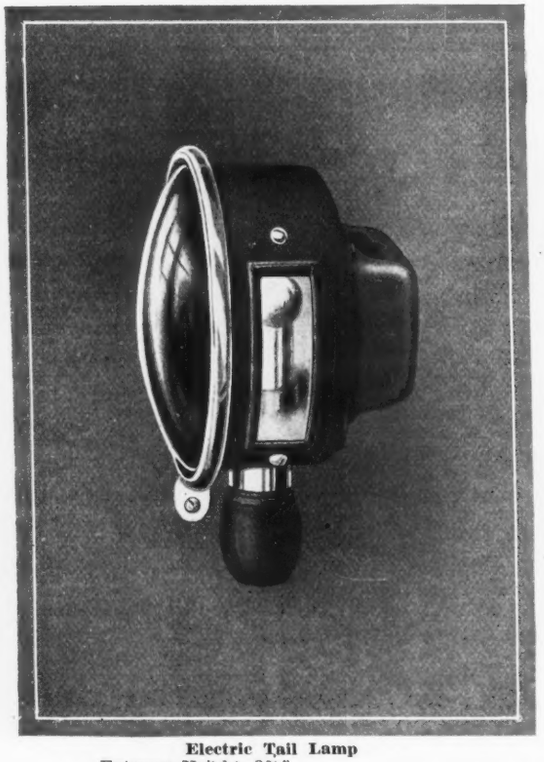


Electric Headlight
Extreme Length, 7¾"
Diameter of Reflector, 9⅜"
Extreme Height, 12½"
Distance bet. Props, 9¼"
Parabolic Reflector, Silver Plate

Model No. 508—Torpedo Style

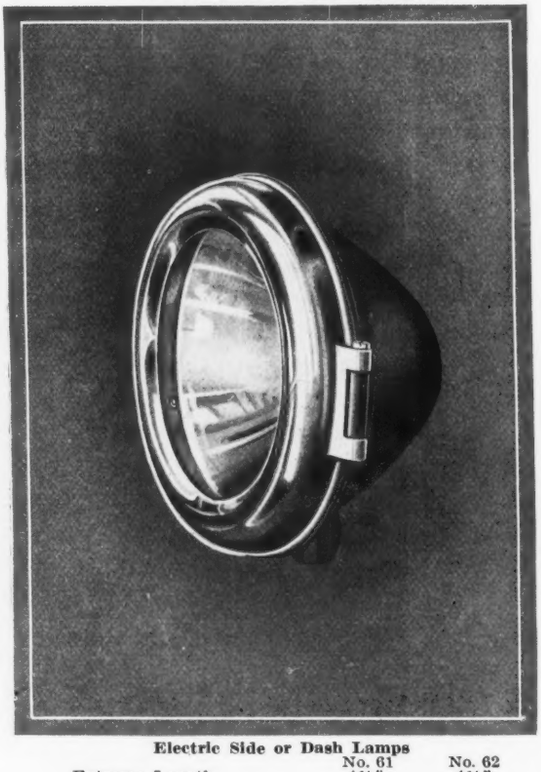
Electric Headlight
Extreme Length, 7¼"
Diameter of Reflector, 8¾"
Extreme Height, 11½"
Distance bet. Props, 8½"
Parabolic Reflector, Silver Plate

Model No. 50



Electric Tail Lamp
Extreme Height, 3⅝"
Extreme Length, 3" Diameter
Silver-plated Reflector
3½ Ruby Corrugated Semaphore Lense

Models No. 61 and No. 62—Torpedo Style



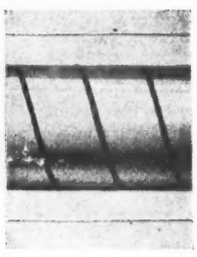
Electric Side or Dash Lamps

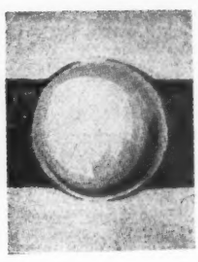
	No. 61	No. 62
Extreme Length	4¼"	4½"
Diameter of Reflector	4⅝"	4⅝"
Extreme Height	6 "	6½"

These Lamps contain Silver-plated Parabolic Reflectors

CORCORAN LAMP COMPANY, Cincinnati, Ohio

Hyatt Quiet Bearings





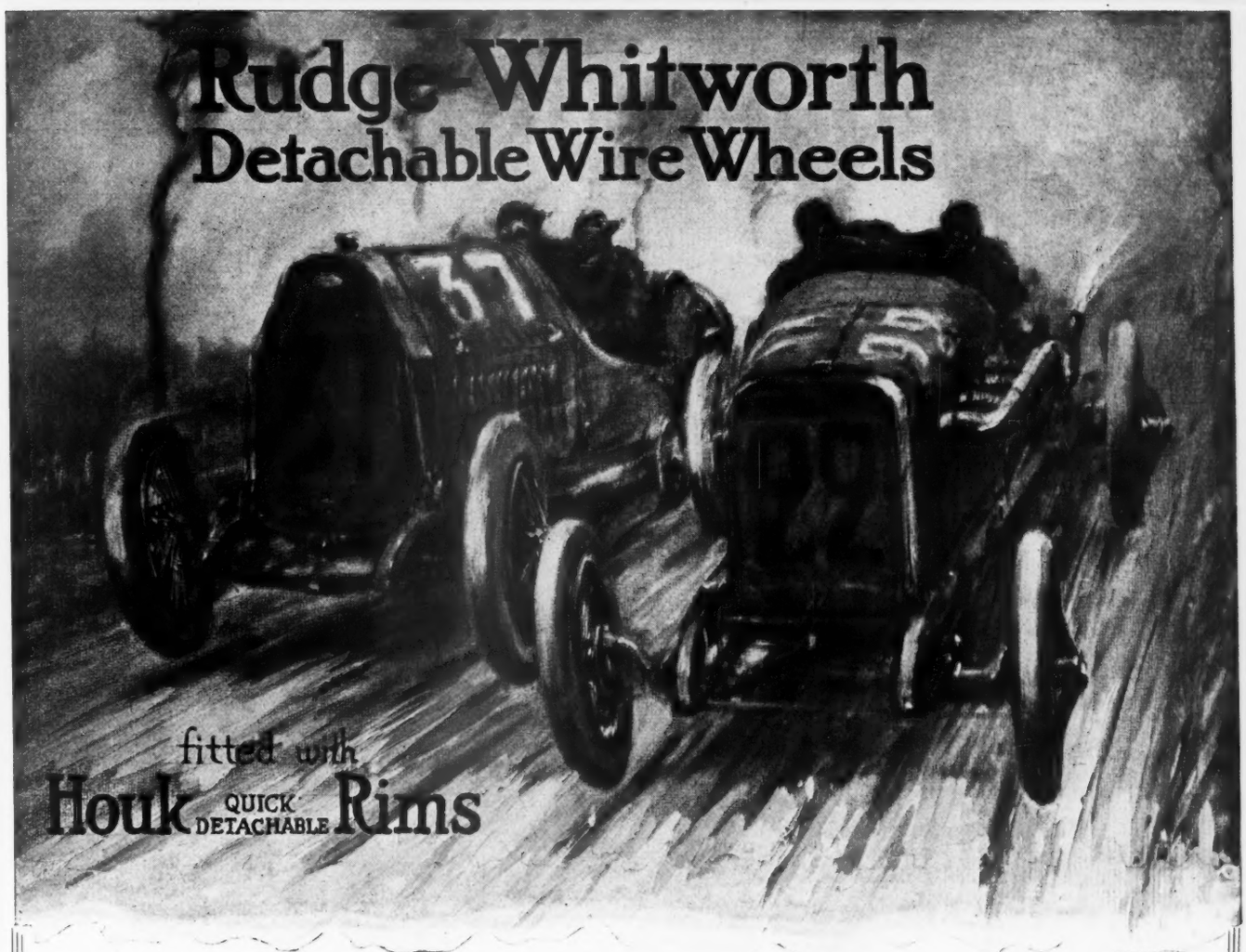
LINE CONTACT is the basic principle of the Roller Bearing as against Point Contact of the Ball. There results a vastly increased surface to support the load, reducing the duty per unit section of the operating parts and increasing their life in a like proportion.

To insure this condition, uniform distribution of load is essential. This necessitates perfection in the manufacture and mounting of the bearing. Perfection is unattainable under manufacturing conditions.

The flexibility of the Hyatt Roller absolutely insures full line contact, hence guarantees uniform distribution of the load.

Flexibility is an exclusive feature of the Hyatt Roller.

HYATT ROLLER BEARING CO.
DETROIT. MICHIGAN



RUDGE-WHITWORTH Detachable Wire Wheels have won the endorsement of motorists both at home and abroad, not because they are wire wheels, but because they are wire wheels scientifically made from the best materials.

Every Rudge-Whitworth spoke is carefully tested for tensile strength, before it goes into the wheel. The tension to which the wheel is being subjected is then learned, and every spoke trued up and adjusted to meet the strain.

No scientific instrument could be made with greater care than is used on the seventy different suspension points of Rudge-Whitworth Detachable Wire Wheels.

No wonder they can't be broken.

No wonder they make smooth running cars.

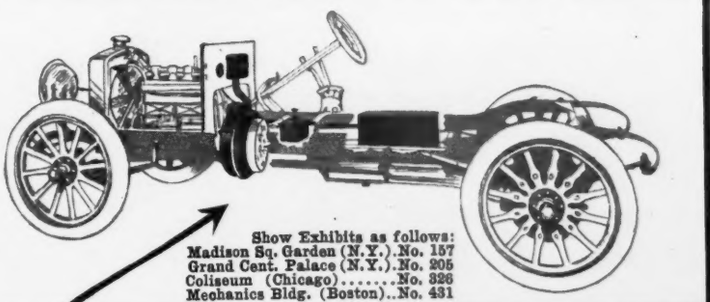
No wonder they cut about 60% off your tire expenses.

They are now being made by the Standard Roller Bearing Company of Philadelphia, and are equipped with the famous Houk Quick Detachable Rim, the best quick detachable rim on the market.

Absolutely Rustless

George W. Houk Company

5002 Lancaster Ave. **PHILADELPHIA, PA.**



Show Exhibits as follows:
Madison Sq. Garden (N.Y.)..No. 157
Grand Cent. Palace (N.Y.)..No. 205
Coliseum (Chicago).....No. 326
Mechanics Bldg. (Boston)..No. 431

How the U-S-L Electric Starter and Lighter is substituted for the fly-wheel of the automobile engine.

Fly-Wheel Made Into a Starter and Lighter!

The most powerful starter on the market
Turns engine over at 150 to 400 revolutions per minute
Is an integral part of engine
Not an extra moving part added
No weight added to car
No chains, sprockets, gears nor belts
No bearings to be oiled
Starts engine AT ONCE—100 times out of 100

Not in the entire course of automobile development has a more revolutionary or more useful device been introduced than the **U-S-L** Electric Starter and Lighter. It puts an end to the uncertainty that has heretofore been associated with gas engine starting devices; it makes a simple touch of a foot button start the motor with a smooth, gradual, continuous torque, entirely unlike the action of starters that depend on sudden explosions and thus impose severe strain upon the automobile mechanism. It works without noise, jerk or jar. It is absolutely certain under all conditions; is practically proof against wear or damage.

With all this, the **U-S-L** equipment is more than a starter; it is a ***complete lighting plant*** for an automobile, furnishing practically unlimited current for any reasonable number of lamps, even for display signs on commercial vehicles. It does away with lighting batteries, or an electric light generator.

USL TRADE MARK
THE UNITED STATES LIGHT AND HEATING CO.

U-S-L ELECTRIC Starter & Lighter

For Gasoline Automobiles

Adopted by Rambler, Overland, Bergdoll, Garford "New Six," Edwards-Knight and Moyer
And Endorsed by the Entire Automobile Engineering Profession

The **U-S-L** is a special motor-generator or dynamo which is installed in place of the usual engine fly-wheel and which starts to revolve at the pressure of a button, thus setting the engine in motion.

It does not add a single extra moving part to the car. No extra weight is introduced; moreover, the **U-S-L** installation keeps the weight **central,** while the usual practice is not only to increase weight but add it to the side or one end of the car.

There are no gears, chains, sprockets nor belts, no bearings to be oiled, no levers nor clutch mechanism added.

No attention is required by it other than occasionally adding distilled water to the battery. The entire device is automatic, both as to starting and recharging.

When the engine reaches sufficient speed, the starter automatically converts into a generator, supplying current direct for ignition, lighting, etc., as well as recharging. It is impossible of battery overcharge, or of unsatisfactory operation under high speed, for the automatic regulator maintains uniformity whether the car is running at sixty-five miles an hour or at fifteen miles.

Another big point of superiority lies in the fact that the **U-S-L** will turn the engine over from 150 to 400 revolutions per minute—having by actual test maintained this speed for more than an hour without exhausting the battery. It is the most powerful starter ever made—will propel the car on first or second speed, and even on high gear, without releasing compression.

If your engine stalls in congested traffic or in a "tight place," simply press the starter button and proceed without thought of gears or spark. This starter will move the car even up severe grades—on a level road will run it 30 minutes without exhausting the reserve current. Thus the **U-S-L** system also becomes an auxiliary power plant to use in an emergency.

Simply pressing the button starts the engine with a smooth, even torque, without jerk or noise.

Remarkable as is the U-S-L in power and ever ready efficiency, it is the simplest of all starting and lighting systems in principle and construction. There is no complicated mechanism to get out of order; nor will extremes of heat or cold interfere with its operation. It is the starter that starts 100 times out of 100 and supplies ample electric current for lighting car.

To have your car of the latest type, and to enjoy a real starter and lighter, select the car equipped with the U-S-L System. Fill in, cut out and mail the information coupon in this advertisement.

The U.S. Light & Heating Company

General Offices: 30 Church St., New York. Factory: Niagara Falls, N.Y.

Branch Offices and Service Stations:
Chicago New York Boston Cleveland Buffalo
San Francisco. Detroit St. Louis

Manufacturers of the U-S-L Storage Battery

The United States Light & Heating Company
30 Church St., New York, N. Y.

Gentlemen: Please send me the U-S-L Bulletins checked below:

1. **U-S-L Electric Starter and Lighter for Automobiles.**
2. Power for Electric Vehicles — Pleasure and Commercial.
3. U-S-L Sparker and Automobile Lighter Batteries.
4. Electric Light for Railroad Cars.
5. U-S-L Storage Batteries for Stationary Service.
6. U-S-L Storage Batteries for Independent Electric Lighting.

(NOTE — With the bulletins we send the U-S-L Book illustrating and describing the U-S-L facilities, service and products.)

Name.....
Street.....
City..... State.....

No adjustments—no moving parts—make

ZENITH

Carburetion Standard Carburetion

That the Zenith Carburetor and its principle of simplicity are successful is proved by its record in Europe, its birthplace.

There it has been in use for six years; and on some of the leading cars of the Continent.

At the recent Olympia Show in London, Zenith was the equipment of more than 29 per cent. of the cars displayed. Its closest competitor had a percentage of 13.

We attribute the success of the Zenith entirely to its simplicity.

Zenith Sets Brooklands Record

At Brooklands recently a Zenith-equipped Vauxhall, four cylinders, 3½x4⅝, broke the track records set by a Sunbeam six-cylinder car, as follows:—

97.15 miles per hour in 50 laps; and one mile at a speed of 99.61 miles per hour.

Previous record: 93.75 miles per hour for 50 laps; 99.45 miles per hour for the mile.

It has no moving parts but the float—not a spring, a ball or anything else.

It has not a single adjustment.

As it is made for a motor, so it remains forever—always supplying the correct mixture at high speed and low speed, under load and light, by means of its compound nozzle.

To the manufacturer it is a standardized part. It is fitted in place; and there is no adjusting to do, no tuning up.

It requires no more attention in assembly or test than the finished cylinder block.

To the user, it is a boon. It does its work perfectly under any conditions and all conditions.

It is flexible to the last degree; economical, efficient; and for the first time it gives the word "automatic" its true meaning as applied to carburetors.

Zenith Carburetor Company, Detroit, Mich.

NEW YORK
Mercedes Repair Co.
159 E. 54th St.

PHILADELPHIA
United States Motor Tire Co.
818 N. Broad St.

EISEMANN

THE Eisemann Magneto Company will not exhibit at the Automobile Shows this year. The decision to withdraw from the shows came only as the result of being unable to obtain space suitable for properly exploiting Eisemann products. We will have our entire staff on hand in New York during the New York Show and in Chicago during the Chicago Show. Arrangements have been made whereby all those desiring demonstration or information concerning any of our products will be well cared for.

With the exception of the addition of the Type E-B High Tension System with Separate Transformer Coil, there has been little or no change in the Eisemann products for the coming year. We will still continue to produce the type E-M High Tension Magneto, both dual and single; the types E-A, E-U and E-D in both single and dual, together with the Automatic Spark Control, which has proved itself to be so truly wonderful an instrument for commercial truck purposes.

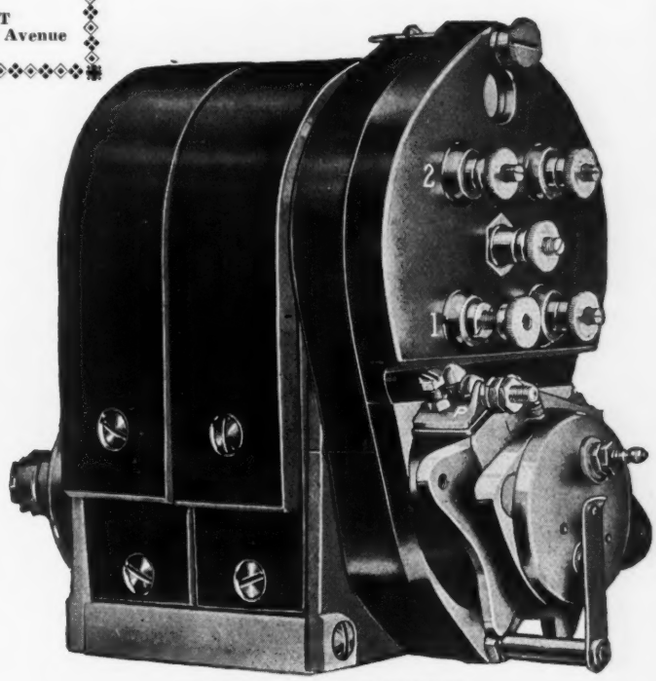
We wish to announce herewith the opening of a branch, complete repair shop, etc., in Detroit, in charge of Mr. Fritz Neef.

The Eisemann Magneto Co.

Sales and General Offices
225-227 West 57th Street, NEW YORK

INDIANAPOLIS
514 North Capitol Avenue

DETROIT
802 Woodward Avenue



TYPE E-M FOUR CYLINDER

Let Me Demonstrate This Musical Horn to YOU

G. V. P. Lansing

I want you to **hear** this musical Auto horn—to listen to its courteous signal. I know that I can't **describe** its tone. All I can say is that it has a clear, distinct, chime-like warning, produced by four musical notes. I want to demonstrate the Aermore to you. I want you to hear it **yourself.** Just write me today for my special offer.

When Mr. Fulton put one on his car he told me: "It sings like an organ and you can hear it a mile away." You'll say the same when you hear

The AERMORE Exhaust Horn

—the Horn Harmonious

It's the only self-cleaning exhaust horn on the market. Can't clog. Can be attached to any exhaust pipe in a few minutes. Made in four sizes for different H. P. engines. Prices: $7.50, $10.00, $11.00 and $12.00.

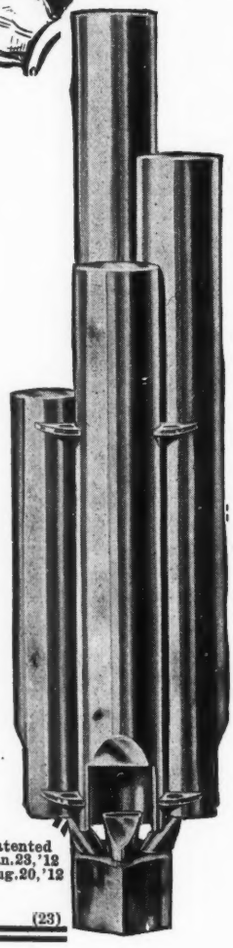
Write Me Today for Literature

Get my offer to demonstrate this musical horn to you. Write me today. I'll also send you descriptive literature. When you see the principle of the Aermore Horn you'll decide right then that it's the most efficient signal device made. Now send me a postal and get my special offer to demonstrate the Aermore to you. Write me today.

G. V. P. LANSING, Pres.

Aermore Mfg. Company

Dept. 5578, 1536 Michigan Blvd., Chicago, U.S.A.



Patented Jan. 23, '12 Aug. 20, '12

(23)

Aermore Mfg. Co. is a wide awake concern which is buying one by one, as it can, the best ideas and inventions in the Motor accessory line and manufacturing for the trade

The Aermore Horn made this concern famous.

The Sabo Motorcycle Lock is now here.

It speaks for itself

The Shlosberg Muffler is coming.

It is what the Motor world is waiting.

We are determined that what we make shall be

The best kind of the best of its kind

ANNOUNCEMENT!

THIS is to announce to the public that we have just acquired the entire manufacturing and selling rights for a new Motorcycle Side Car—a handsome model built on automobile lines. It can be attached to any motorcycle in a few minutes. For practicability, graceful lines and exceptionally low cost this new motorcycle side car surpasses anything now on the market. It answers the tremendous demand of small retail merchants for a delivery system that means quicker, cheaper, surer deliveries. This new side car will undoubtedly create a sensation among dealers and users. We invite correspondence.

AERMORE MFG. CO., 1536 Michigan Blvd., Chicago, U. S. A.

Non-Carbon Starter

The STARTER which REALLY STARTS

Manufacturers--Dealers--Owners

YOU who have not investigated the NON-CARBON Starter will find it to YOUR interest to do so.

The NON-CARBON Starter is not a cheap Starter; nor a high priced Starter misrepresented.

The NON-CARBON Starter is pronounced the ULTIMATE Starter, by its users.

Listen! The NON-CARBON Starter is fundamentally different. Lay aside your prejudice. The Non-Carbon Starter is the one success.

It contains a real Non-Carbon MIXER.

The Starter forces air into the cylinders with only a very small per cent of acetylene. We want it positively understood that the NON-CARBON Starter does NOT force pure acetylene into the cylinders, which will ignite only occasionally and form a great amount of carbon.

Each cylinder receives an equal amount of highly explosive mixture, forming a complete combustion, which has been prepared by the Non-Carbon MIXER.

As a result, the NON-CARBON Starter is the one Starter which Starts the motor **every time** a spark enters the cylinder, regardless of temperature. The NON-CARBON Starter is a real Starter which Starts and not a Starter by name only.

It produces absolutely no carbon; is positively non-injurious to the motor. **Also, when gasoline is exhausted, the Non-Carbon Starter will actually propel your car.**

GUARANTEED TO GIVE SATISFACTION

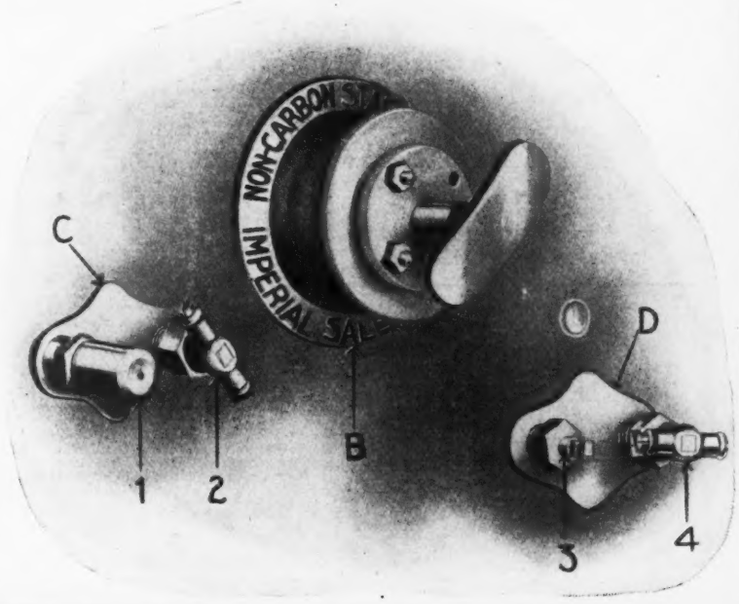
Easily Operated **Readily Installed** **Dependable**

$30 for a Four Cylinder Starter **$40 for a Six**

Live Dealers Are Given Exclusive Territory

Dealers, you can recommend a success, not an experiment. If you are in territory which you do not KNOW has been contracted for, write us.

Owners, send us your order with check for Non-Carbon Starter, name of car, model, number of cylinders, and name of dealer with whom we can make arrangements for installation, and you will receive a Starter which will give satisfaction, or money refunded.



IMPERIAL SALES COMPANY
TIFFIN, OHIO

NEWTONE HORNS

We are the pioneer horn makers in the United States. 75 per cent of the horn consumption of the country is supplied by this company. The following statement will give an idea of the magnitude of our business. Note that during the past six months—what we consider the dull season—we have made and shipped over 22,000 horns monthly.

READ THIS AFFIDAVIT:

Helen L. Hicks, of Borough of Brooklyn, City and State of New York, being duly sworn, deposes and says that she has been employed by the Automobile Supply Mfg. Co., a domestic corporation, for about two years, last part in capacity of billing clerk and general office work, and that she is familiar with the shipping slips, shipping books and bill books.

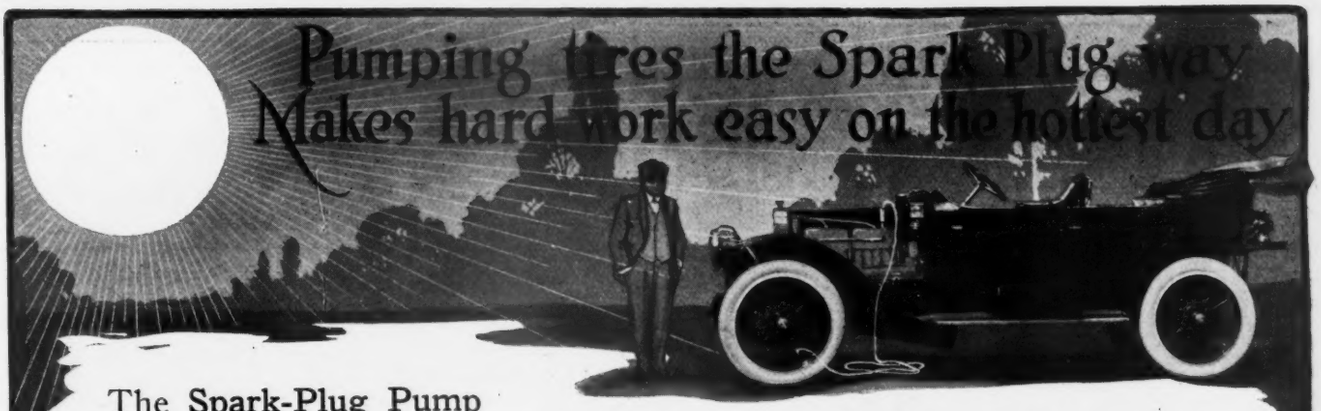
Deponent further states that she has examined said books and same show that the Automobile Supply Mfg. Co. shipped

In June, 1912—17,028 Bulb and Electric Horns of different sizes and types.
In July, 1912—22,006 Bulb and Electric Horns of different sizes and types.
In Aug., 1912—19,866 Bulb and Electric Horns of different sizes and types.
In Sept., 1912—26,156 Bulb and Electric Horns of different sizes and types.
In Oct., 1912—26,103 Bulb and Electric Horns of different sizes and types.
In Nov., 1912—22,392 Bulb and Electric Horns of different sizes and types.

Sworn to before me this 12th
day of December, 1912.

(Signed) HELEN L. HICKS.

(Signed) ISAAC BROWN,
Notary Public, Kings Co.



The **Spark-Plug Pump**
removes one of the most objectionable features connected with motoring.

Will Inflate the Largest Tire In From 2 to 4 Minutes

Simply remove a spark-plug from any convenient cylinder and substitute the pump. It will inflate the tire with **pure, fresh** air. Gas or oil cannot be drawn from the cylinder.

Constructed To Last As Long As Your Car

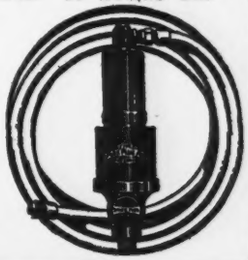
The construction is absolutely simple—**just like that of your engine with metal rings.** No wearing parts to get out of order. An occasional drop of oil is all the attention the pump ever requires. It weighs but 2½ pounds, and can be easily carried in the tool box. **It works equally well on all size cars from the smallest Ford to the largest Lozier.**

TRY ONE FREE ON YOUR CAR

Furnished with adapter to fit any car, and complete with 12 feet of hose and connections.

$10

Same pump equipped with thoroughly reliable pressure-gauge installed in hose-line—$2.00 extra.



See Our Exhibit At New York Show, Space 518, Sec. 1, and at Chicago

Manufactured by

MAYO MANUFACTURING CO.
54 East 18th Street. Chicago, Illinois.

1913'S TRADE SENSATION!!!

BOYCE MOTOMETER

PAT'S PEND'G

(Front View, Half Actual Size)

Know the EXACT HEAT of Your Motor While Driving

The MOTOMETER is a watchlike instrument fitted to any radiator cap, protecting the motor from damage caused by improper lubrication, overheating, defective cooling, etc. By means of a red fluid indicator it warns

WHEN THE RADIATOR NEEDS WATER
WHEN THE OIL SUPPLY IS INSUFFICIENT

In short, it tells whatever excessive heat tells—a broken water pump, a clogged pipe, a broken fan belt, etc., and tells before the damage is done. Attached the same as an ornament, readily visible from the seat day or night, the MOTOMETER registers the inside temperature of the radiator. It will prevent frozen radiators in winter and cracked cylinders in summer.

"More Necessary Than a Speed Indicator"

View From Seat

The Price is $10.00

Finished in black enamel with gold-plated or nickel rims. If your dealer cannot supply you, send check or money order and we will express an instrument prepaid. Sooner or later you will drive a Motometer equipped car. Why not enjoy it now?

DEALERS—The MOTOMETER is the handsomest and most meritorious accessory offered for 1913, selling at a price that means no dead stock.

THE MOTOMETER COMPANY, Inc., 1788 Broadway, New York City

Exhibiting Madison Square Garden Automobile Show—Space 540, Basement

$17.50 Complete

Pump, 60 Gallon Tank and Piping

We have furnished tanks to other manufacturers, but now offer to sell to you direct. Note the saving.

Write for description and list of other sizes.

Niles Steel Tank Co., Niles, Mich.

Standard Universal Rims

fit any style or make of tires. The side rings are reversible, they curve outward on one side to fit a straight side tire, inward on the other to accommodate a clincher. Two turns of a nut unlocks the rim for demounting, two more turns locks the rim in place.

Write for catalogue 606, which explains fully.

THE UNITED RIM CO., AKRON, OHIO

The Searchlight Gas Co.

1016 Karpen Building

Chicago, Illinois

Stronger than ever, legally, financially and in the esteem of the trade. Watch us grow.

BRANCHES AND REFILLING STATIONS:

Warren, Ohio.	San Francisco, Calif.	Los Angeles, Calif.
Chicago, Ill.	Buffalo, N. Y.	New York City.
Detroit, Mich.	Atlanta, Ga.	Syracuse, N. Y.
Camden, N. J.	Dallas, Texas.	Minneapolis, Minn.
Philadelphia, Pa.	San Antonio, Texas.	Toronto, Canada.
Kansas City, Mo.	Boston, Mass.	Indianapolis, Ind.

Give Full Value

For Every Cent Paid

Knight tires are sold at a price based on the character of the material used and the labor employed to make them. They wear longer than other tires and give greater riding comfort.

You get what you pay for when you buy Knight tires. Write today for descriptive literature.

THE KNIGHT TIRE & RUBBER COMPANY
CANTON, OHIO

We Ship On Approval

PREPAY FREIGHT AND ALLOW

30 Days Free Trial

The best "Nonskid" puncture-proof device on earth for automobiles and motorcycles.

Try Them At Our Expense

Be your own judge—don't take anyone's word for it. *"The proof of the pudding is in the eating."*

IT ONLY COSTS ONE CENT to learn our unheard of prices and marvelous guarantee on Brictson Detachable Treads.

Write Today for Full Particulars

The Brictson Mfg. Co.
1213 Brictson Building
BROOKINGS, S. D.

GILMER Tire Repair Pliers

are as necessary to Car Users as a pocket knife is to you—as useful as a hair pin to a woman. There are 300,000 Car Owners in the United States who KNOW that it pays to repair small cuts in Tires. ARE YOU ONE OF THEM? Hadn't you best write for free copy of "Tire Insurance," or better, send a dollar for a pair of nickel plated PLIERS and combination cleaner and cotter pin hook? They will pay for themselves the first seventy-five miles. They will pay for a set of Tires every 4,000 miles. We guarantee satisfaction.

Pliers opened, distending cut for cleaning, tool applying gum. Ratchet in handle holds Pliers open. (Pat.)

G. Walker Gilmer, Jr.
53 N. 7th St., Philadelphia, Pa.

Wasting Tire Money That's what you're doing when you allow water and sand to work into the fabric through small cuts and bruises, rotting them and causing blow-outs.

THE GIBNEY Eleck-Trick Vulcanizer

seals these cuts and makes tubes and tires run double and treble the usual time

Easy to Operate—It Operates Itself

An illustrated book, telling how to double the life of your tires, awaits your request for it.

JAMES L. GIBNEY & BRO.
215-217 North Broad Street, PHILADELPHIA, PA.
248-252 West 54th Street, NEW YORK CITY

CLASSIFIED ADVERTISEMENTS

The Trading Center of the Motor Car Industry — MOTOR AGE — Rates—20¢ per line — 6 words to a line

Cars For Sale

AUTO RACING TEAM FOR SALE—WILL sacrifice my special built racing team, three of the fastest cars in the country in perfect condition. One 40 h. p., one 50 h. p., one 150 h. p. French exhibition car, and can prove to you that this team is a money-maker. Extra magnetos, carburetors, crank cases, timing gears, tires and full racing equipment. Would prefer selling these cars together, as it would be a shame to break up this team. For full particulars, address C. H. K., 6128 Prairie Ave., Chicago, Ill.

A 7 PASSENGER, 40 HORSE POWER White Steamer and one 20 h. p. 4 pass. Both machines like new. Joy valve engines, kerosene burners, operating for one-half cent per mile. Address Box D 151, c|o Motor Age. w

BARGAINS—BARGAINS—BARGAINS.
At 50% less than any dealer.
DON'T MISS THIS OPPORTUNITY.
Seventy-five cars to select from, all models and horse power, also landaulet, limousine and open foredoor bodies, engines, frames, axles, magnetos, radiators, carburetors, and Parts for Almost Any Make of Car in the Market. Following are some of the special offers:

Buick 1911, 2 cyl. truck	$275
Thomas Detroit 1908 runabout	300
Thomas Detroit 1908 40 h. p. touring	250
Selden 1910 30 h. p. touring, 5 pass	300
Stevens 6 cyl., 60 h. p. chassis	375
Apperson chain drive, one ton wagon	250
Berliet Alco 70 h. p. runabout	575
Diedietrich 60/70 h. p. runabout	850
Stoddard Dayton 50 h. p. runabout	750
Stoddard Dayton 40 h. p. touring	500
Oakland 1912 40 h. p. chassis	625
Acme 6 cyl. touring, late model	375
Thomas 6 cyl. 70 h. p., 7 pass	675
Panhard 12 pass. buss	500
Delauney Belleville 12 pass. buss	500
Chalmers 1909 touring car	375
Chalmers 1910 touring car	475
Chalmers 1911 touring fore-door	700
Chalmers 1912 touring fore-door	850
Peerless 1910 chassis, like new	800
Rochet Schneider chassis wagon body	350
Thomas 1909 4 cyl., 60 h. p., chain drive	500
Pierce 30 h. p. with 1912 fore-door body	750
Packard 1907, new body, 7 passenger	750
Oldsmobile Autocrat 1911, special	750
Fiat 40 h. p., fore-door, double chain	800
Simplex 50 h. p., with new fore-door, gunboat body; a beautiful car	1150
Itala 30 h. p. chassis, with Mea magneto	650
C. G. V. 30 h. p. chain drive chassis	225
Amplex chassis, like new, late model	650
Benz 1910 60 h. p. chain drive chassis	950
Benz 1911 35 h. p., shaft drive chassis	1100
Pope Hartford 1907 touring Mea mag	300
Two Thomas taxicab chassis 1909	150
Regal, inside drive coupe	375

MOTORS

Rainier 1911, 50 h. p., motor perfect	240
Columbia 1909, 40 h. p.	125
Reliance 4 cyl., 2 cycle	100
Pope Toledo 4 cyl., 45 h. p.	135
Rolls Royce 6 cyl.	225
Cadillac 4 cyl., 30 h. p.	125
Thomas, needs assembling, 6 cyl., 90 h. p., and some parts	125

AXLES
Rainier 50, Rainier 30, Packard 30, Thomas Cleveland, Cadillac, Haines, Delahaye, Corbin, Pope Hartford, etc.
Pacific Motor Car Exch. Co., 229 W. 54th St., N. Y. M. Rozenweiz, Gen. Mgr.

CADILLAC LIMOUSINE, WITH EXTRA touring body, top, glass front and fenders, overhauled, guaranteed like new, 1911 model. Iowa Auto & Tire Co. (Cadillac Agents), Davenport, Iowa.

FAL CARS AND REPAIRS
F. A. L. Auto Co., 4052 Princeton Ave., Chicago. Phone Drover 1712.

FOR SALE—CHEAP, ONE AMERICAN Traveler, color battleship gray; just like new; run a little over 5,000 miles. Michigan Auto Co., 410 7th St., Calumet, Mich.

FOR SALE—DELIVERY CARS: ONE IN- ternational with top, one Cadillac single-cylinder, overhauled, repainted. Neiman Machine Works, Freeport, Ill.

FOR SALE—FIVE PASSENGER DREAD- nought-Moline; run 6,500 miles. Car is guaranteed. Horst & Strieter Co., Rock Island, Ill.

FOR SALE—ONE 40 H. P. POPE TOLEDO automobile, in good running order; price $200. David Blair, Broadalbin, N. Y.

FOR SALE—ONE 40 H. P. TEN PAS- senger bus, 34x4 tires on front, 36x4½ on rear. This car also has a five passenger touring body that goes with it at this price. This car is in extra good condition and is just the rig for some one having use for a passenger bus, touring car, or truck. A bargain at $325. Address, Walter Robinson, Ligonier, Ind. m

FOR SALE—STANLEY STEAMER, IN EX- cellent condition; cheap. W. J. Morgan, Box 284, Seaton, Ill.

FOR SALE—WHITE STEAM CARS, VARI- ous models, in excellent condition; also parts for steamer engines and generators. We specialize in steamers. Joseph Libal, 3145-53 N. Halsted St., Chicago.

FOR SALE—1911 HUDSON AND CHAL- mers touring cars, with two taxi bodies. Full particulars. Address J. McDonell, Aetna Hotel, Danville, Ill.

FOR SALE—1911 MODEL STODDARD- Dayton automobile, 7-passenger, 50 h. p., equipped with all auxiliaries. In perfect condition. Address Box D 220, c|o Motor Age.

FOR SALE—20 PASSENGER SIGHTSEE- ing car; good condition; cheap for cash. Box D 140, c|o Motor Age. m

FRANKLIN 18 H. P., IN FIRST-CLASS shape; guaranteed; new paint; good tires and top; high tension magneto; 1909 model; 5-passenger, $400. Cash or diamonds.
C. W. Lindsay,
Houston, Tex.

FRANKLIN

1910 Model D, 5-passenger, fully equipped, refinished, $750. Franklin Motor Car Co., 733 Boylston St., Boston, Mass.

GOING TO BUY A USED CAR?
Let us send you the names of individual owners. Free weekly report gives complete descriptions, prices, etc. Save money by dealing direct. Write now.
Auto Reports Bureau
310 Shops Bldg., 19 N. Wabash Ave.,
Chicago.

LATE MODEL PAIGE-DETROIT ROAD- ster fully equipped in good mechanical condition. Will sell at a very low price. The White Co., 2635 Wabash Ave., Calumet 5311, Chicago.

MAXWELL RUNABOUT, BOWSER GASO- line outfit, vulcanizing plant, will sell cheap or trade. Geo. B. Johnson, Lebanon, Ohio.

MITCHELLS REBUILT, GUARANTEED.
These cars are fully equipped. Call or write for further particulars.
Mitchell Automobile Co.,
2334-36-38 Michigan Ave., Chicago.

PREMIER
Rebuilt cars like new.
Must sell quickly to make room for new Models.
1911 Stearns. 1910 Winton.
1911 Chalmers. 1909 Peerless.
Will make special price to move these cars.
The Quality Car Co.,
2329 Michigan Ave., Chicago.
Cal. 4501.

HERE ARE THE THREE GREATEST
Automobile Bargains in the World

NEW, NEW

FIRST—1912 absolutely new 7-passenger cars, one of Detroit's leading makes. Never sold before or elsewhere for less than $1,950. Guaranteed for life.

While they last, our price.....$1,185.00

SECOND—A handsome, large, powerful roadster, 1912 model. New 30 h. p. made in Detroit and a car that enjoys an enviable reputation.

Guaranteed for life.
This car has never been sold for less than $1,500.

Our Price $875.00

THIRD—A classy up-to-date roadster built along the most advanced lines. This car has less parts than any other car in the world. It is the easiest riding car in the world and has more new features than shown in any other car built.

This is a 1913 36 h. p. center control roadster.
Regular Price $1,390.00
Our Price 875.00

The supply of these cars is quite limited and there is no possibility of getting any more, so we strongly urge you to come and see us at once. You will want a car in the spring and by buying now you can save nearly half. All of these cars are being sold by us for less than they cost to build.

Every one carries the full guarantee and is backed by the strong, active factories able to take care of all their obligations.

OUR SECOND HAND DEPARTMENT

Has also seen a wonderful change. Every car has been reduced to meet the prices on our new cars and we are taking big losses.

This means that you can buy a second hand car for $300 to $400 that one month ago would have cost $500 to $600.

If you cannot afford a new car, we can furnish a good used automobile thoroughly overhauled and in splendid condition; such a car will give you service for years. Now is the time to buy; you can save money by seeing us now.

Besides Automobiles we carry a full line of everything for an automobile, including new foredoor bodies (all sizes), new tops, wind shields, wheels, engines, raiators, fenders, axles, etc.

Our new Catalogue describing all the supplies will be sent out this week. Send for it; you cannot afford to be without one. Every article is listed at 50c on the dollar.

TIMES SQUARE AUTOMOBILE CO.,
1210-1212 Michigan Ave., Chicago, Ill.

PACKARD DEMI-LIMOUSINE; BEST OF condition. Krit coupe, just overhauled and painted, for sale cheap. Ajax Auto Co., 834 E. 43d St., Chicago.

STEARNS-KNIGHT TOURING CAR
Condition like new; driven but 3,000 miles. Has complete equipment, including seat covers. This car is like new. Have sold original owner 7-passenger Stearns. Price, $2,250. Manchester Auto Garage, 75 Granite St., Manchester, N. H.

SPEED RATE OF 100 MILES AN HOUR guaranteed—Stanley racer—low price. Excellent condition. O. P. Tyler, 31 Central St., Worcester, Mass. m

WE HAVE REAL BARGAINS IN USED cars: One E. M. F. run less than 7,000 miles; all new tires and complete in every way, $600; 1 Buick roadster, complete, $375; 3, 1911 Fords, complete, $375; 1 5-passenger Reo, $250; 1 Westcott, $100; 1 McIntyre, $100. The above cars have recently been overhauled and are in good shape. Mankato Automobile Co., Mankato, Minn.

WINTER SICK CARBURETERS AND MISS- ing motors cured by hot-air pipe to carbureter. Absolutely vaporizes gasoline. Pick-up, power, economy gained. You install our complete outfit ten minutes. Outlasts car. Effective and cheap. Write us now for details. Breeze Carbureters, Newark, N. J.

1905 PACKARD 4-PASSENGER, GOOD shape, $300; 1907 Thomas 7-passenger, double chain, $200; 1-cylinder Cadillac or Olds, each, $50; 1907 Thomas and model R Stevens, parts cheap, front and rear axles with wheels, $10. Fred Peulecke, 9237 Houston Ave., South Chicago, Ill.

1912 MERCER, 4 PASSENGER, NEW AND perfect, used but few miles, cost $2,900. Must raise money, so will sacrifice. S. Z. Silversparre, 1717 E. 7th Ave., Denver. b

1913 PACKARD—WILL DISPOSE OF MY new 1913 6-cylinder, 7-passenger touring car at a bargain, if taken immediately. Address H. M. Wallis, Jr., Racine, Wis.

Cars Wanted

AUTOMOBILE WANTED

In exchange for good land, or for residence lots in Hugo, the best town in eastern Colorado; let me know what you have; 5-passenger machine, in good order only, wanted. F. E. Ewing, Hugo, Colo.

WANTED—1912 AUTO IN EXCHANGE for 160 acres good Minnesota land. Address Box 414, Marshalltown, Ia. k

WANTED—1912 E-M-F OR SIMILAR CAR in exchange for other property. Might pay cash. Give particulars and lowest price. A. M. Ericson, Hector, Minn.

WE BUY AND SELL YOUR AUTOS FOR cash. If you have a Touring Roadster, Limousine, Taxicab, Commercial Car, Truck or Sightseeing Car and desire to dispose of it quickly, communicate with us. Give us full description. Late models and in good condition. Strictly business. Enclose stamp for reply. Universal Auto Sales Co., 1826 Wood Ave., Harrisburg, Pa.

WE BUY SECOND HAND AUTOMOBILES

For Spot Cash

Anywhere in the United States

Send us complete description and lowest cash price.

AUTO TRADING CO., INC.

16-18-20 Center Ave., Pittsburgh, Pa.

Parts and Accessories FOR SALE

A BARGAIN—TWENTY SETS OF MARSH Rims, Q. D., size 36x4. Twelve Bodies—four and five passenger—high grade. The Sebring Motor Car Co., Sebring, Ohio.

A BATTERY BARGAIN—6-80 STORAGE batteries, Exide, Vesta, National, Universal, for auto igniting and lighting, $1.50 to $7.50. 4105 Cottage Grove Ave., Chicago. a

A LIMITED NUMBER OF NEW HIGH grade 25-30 and 30-35 h. p. four-cyl. motors with Remy magneto and coil. Only a few left. Prices very low. F. E. Alford, Goshen, Ind.

ALL NIGHT MACHINE AND GARAGE CO. Shop operated every hour of every day. No extra charge for night work. Make any part for any car. We hurry up. 7031 So. Chicago. Ave., near Cottage Grove Ave., Chicago. Dan Morgan Smith (owner). Phone Normal 3266.

ATTENTION—HENRY OWNERS

Having purchased the repair business of the Henry Motor Co., we are prepared to fill orders promptly for repairs for Henry cars.
Muskegon Automobile Co.
Muskegon, Mich.

AUTOMATIC ENGINE STARTERS (Spring), guaranteed; $100 to $125. J. W. Tudor, 35 Congress St., Boston, Mass.

AUTOMOBILE BODIES, PLEASURE AND commercial.
Foredoors for open-front cars.
Write for prices.
Auto Specialty Mfg. Co., 326 E. Market St., Indianapolis, Ind.

A WET CLOTH AND A PACKAGE OF Ar-Gen-Tor is all that you need to plate all the brass trimmings on your car with a heavy, permanent plate of pure silver. Your car will always look new, and you will not have to polish brass any more. Does not contain mercury or poisonous cyanide. Send $1 today for large size box.
Forest City Sales Co.
Fremont, Neb.

BALL & ROLLER BEARINGS, ALL TYPES.
Distributors of
"F & S" Ball Bearings.
"New Departure" Ball Bearings.
"Pressed Steel" Ball Bearings.
"Standard" Ball and Roller Bearings.
BALL BEARINGS REPAIRED
THE GWILLIAM COMPANY,
New York—Broadway, at 58th St.
Philadelphia—1314 Arch St.

BODIES, FOREDOOR, TOURING RUN- about, $15.00 to $50.00. Fenders painted dark blue, $10.00 set of 4; Selective type 4-speed shifting levers complete with emergency brake lever, $8.00. Other bargains. Automobile Appliance Co., 1712 Michigan Ave., Chicago, Ill.

BUICK OWNERS

Why pay two prices for a radiator?
We guarantee them when we sell them at

Buick "10," "32" and "33".....$26.50
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CELLULOSIA—BEST SUBSTITUTE FOR glass used in automobile and buggy storm fronts, side curtains, etc. Sheet 20x36 in., 85 cents; 12x20, 35 cents, postpaid. Hawes Storm Front Co., Coldwater, Mich.

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One piece aluminum; immediate shipment subject to inspection.
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For Sale. Only a few. Equip your car with a self-starter for this winter. Guaranteed new stock. List price, $50; our price, $12.50. Parsons Sales Co., 1817 Grand, Kansas City.

"DON'T ENVY A SMOOTH RUNNING MO- tor, use Hagstrom Spark Plugs and have one." Write for gas tank key and price list to The Hagstrom Bros. Mfg. Co., Inc., Lindsborg, Kan.

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Use Our Heater.
For full particulars write to
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DRAGON REPAIR PARTS.
We manufacture and keep on hand all repair parts for the Dragon cars. We make a specialty of repairing this machine. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

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We can furnish a complete system for $36. This outfit consists of one 6-volt, 140-ampere battery, two head lights, two side lights, one tail light, wire for car switch and bulbs. Head lights are 10-inch solid brass with silver plated parabola reflectors, and side lights are 5-inch same material. The Ampvo Battery Co., 1607 Michigan Ave., Chicago, Ill.

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$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

FORD, HUPP AND MAXWELL
Muffler cut-out machined ready to attach, including lock, open pedal string and cables, $1.35. Lincoln Machine Shop, Lincoln, Ill. c

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A postal brings you our 1912 catalog of 22 necessities for your car. Auto Parts Co., Providence, R. I.

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FORD OWNERS—TOWNSAN VALVE AD- justers will quiet your motor. $1.50 by mail. Townsan Auto Specialties Co., Mitchell, S. D.

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Foot throttle or accelerators, $1.50. Lincoln Machine Shop, Lincoln, Ill.

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Made for all makes of cars. Prompt shipment guaranteed. F. E. Lortz Co., 2503 E. 55th St., Cleveland, O.

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FOR SALE

Four-cylinder, new motor, 20 h. p....$120.00
Selective sliding transmission..... 35.00
Cone clutch 20.00
150 Northway type new motors, guaranteed; fitted with oiler and pump .....each 140.00
1000 pressed steel frames.....each 3.00
134 Sheldon shaft drive axles....each 35.00
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100 sets 36x3½ wheels with Q. D. rims .....per set 12.00

We also have all sizes of truck axles, and parts to build cars. Write for our No. 650 Bargain Sheet.

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FOR SALE—ONE LIMOUSINE BODY FOR Stearns 30-60 chassis. Body cost $1,750 when new; used one season and in perfect condition. Price, $800 f. o. b. Louisville.
Louisville Lozier Company
Louisville, Ky.

FOR SALE—ONE 1910 5-PASSENGER, body and top, upholstering, in A-1 condition, for 1910 Cadillac chassis. Cadillac Automobile Co., Peoria, Ill.

FRAMES, 34-INCH WIDE—112 W. B. straight, each $10.00
Frames, 36-inch wide — 112 W. B. straight, each 12.00
Frames 36-inch wide — 124 W. B. straight, each 14.00
Unassembled frames—Kickup 112-inch W. B., 34-inch wide, each..... 8.00
For assembling each..... 4.00
Wheels—34x3½, 32x3½, 36x4½, per set. 12.00
Axles—40-50 H. P., rear, each....$45.00 50.00
30-40-50 H. P., front, each..... 12.00
Radiators, 30 H. P., honeycomb, each.. 14.00
Address Box D 169, c|o Motor Age.

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20 high grade wind shields.....$ 7.50
1 new Maxwell two-cylinder motor and transmission, complete, with magneto and carburetor..... 125.00
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2 front axles..... 5.00
50 wheels, different sizes.....each 1.00
The Schissel Auto Co.,
Cherokee, Iowa.

KEROSENE FOR AUTOMOBILES. NEW Model B uses successfully half and half mixture lowest grades kerosene and gasoline. Satisfaction guaranteed or money refunded. Greatly increased power, very slow speed on high. Starts easy at zero. Special agents' prices. Department B. The Air Friction Carburetor Co., Dayton, Ohio.

MAXWELL PUSH ROD ADJUSTERS

$1.50 for complete set delivered. Money back guarantee. Auto Parts Co., Providence, R. I.

MAXWELL SELF-STARTERS

Prest-O-Lite Tank Starter.

Don't break your back cranking that car when you can get a self-starter made for your car for $10.

AUTO PARTS MFG. CO.

Detroit, Mich.

MODEL C WINTON, 4-CYLINDER ENGINE transmission and rear axle, all complete and in good shape, $100. A. R. Joy, Smith Center, Kan.

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AUTOMOBILE PARTS AT UNHEARD OF PRICES.

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OUR MOTTO

CASH

No book acc'ts, small over-head expense, no middle-man's commission, sell direct and handle only factory surplus stocks.

Compare the following list with others and you will be convinced.

Item A—Four-cylinder en-block 24 h. p. motors, valves enclosed without carburetors or magnetos; thermo-syphon cooling system, fan and internal vacuum pump oiling system, each $97.00
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Item L—One-ton truck axles, per set. 35.00
Item M—One-ton truck jackshaft, ea. 28.00
Item N—Steering gears.....$15.00 to 25.00
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Item Q—A limited number of two-passenger roadsters, fully equipped, 24 h. p., each $450.00

If you do not find what you want in this list write us; and if it has ever been made we will supply you and at the right price.

Complete chassis and cars designed and parts furnished. Give us your ideas and we will work them out.

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METAL BODIES, SEATS, FORE DOORS, radiators, hoods, tanks and fenders. If building a car we can give you the right price. Auto Sheet Metal Works, 2228 Michigan Ave., Chicago.

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NEW COUPE BODIES FITTED TO CAR, $250. Send for photo.
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PARKINS CARBURETOR, ELECTRIC Horn, Complete Lighting System for Car, Dynamo, Battery, Lamps, Switches, Sockets. Low Prices for Quick Sale. Young, Nyack Ave., Lansdowne, Pa.

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For Mohair and Duck Automobile Tops and Curtains.

Peerless Leather Top Dressing
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For Dyeing Linings of all Tops and Curtains Black.

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For Enameling Lamps, Radiators and Fenders—Air Drying.

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PENNANTS FOR AUTOMOBILES MADE in rights and lefts from any colored felts desired; size 12x30. Price $1.00 per pair. Cash with order. Liberal discount to dealers. J. C. Orcutt & Co., Inc., Lincoln, Neb.

PLATE THE BRASS ON YOUR CAR WITH silver. Our preparation deposits pure silver over the surface of brass. With little expense you can keep the brass on your car a bright silver color. Simple to use, applied with a cloth. We also have the best nickel polish on the market. Does not wear the nickel off, but adds to its luster and durability. $1.00 per bottle. Enough to plate the brass on your car for one year. Agents wanted. Write today.
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Liquidation & Realization Corporation.
One lot new Victor Presto Self-Starters.
One lot Leader Vulcanizers.

Leader Vulcanizer—We have been fortunate enough to secure for quick realization a large lot of Leader Steam Vulcanizers. Double your tire mileage. Leader Steam Vulcanizer will do it. It is the factory process put into a portable size. You do not have to remove the tire from the rim—can be operated on the road if necessary. Can be carried in your tool box.

This device will reduce your tire expense two-thirds, and you escape the delay of sending tires to the repair shop. Anybody can operate. Original selling price $15.00 net. Our price for quick sale $7.50, as long as they last.

Victor Presto Self-Starter—This starter attaches to your Prest-O-Lite tank, and it can be attached by any garage man at an expense of not over three hours at the outside. These starters adopted by 1913 Maxwell and other cars. Were made up for U. S. Motor's car and not delivered owing to receivership. Former list $35.00—Sale Price $5.00.

Must be sold—shipments by express, C.O.D. or send draft with order. Above prices good only while the lots last. Money refunded if not satisfactory.

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Ford, Model T	$16
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And any other make required at equally low prices.

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REPAINT YOUR CAR YOURSELF—WITH our materials and full instructions, you can repaint your car as well as a regular painter and save from $25 to $50, depending on its size. Previous experience unnecessary. Latest colors. Write today for full information and color cards. We also make Liquid Gun Metal, the National Brass Enamel, $1 a can, express prepaid. The only articles of proven merit for lamps, radiators, etc. No polishing. Arsenal Varnish Co., Automobile Dept., Rock Island, Ill.

REPAIR CURTAIN WINDOWS with transparent flexible Pyralin. Sheet 18x20, 50 cents; 20x36, 90 cents postpaid.
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TOPS BUILT, RECOVERED AND RE- paired.
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WE SELL FOR LESS!!!
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Silk mohair top	$10.00
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Puritan Machine Co., 51 Tenth St., Detroit, Mich.

50 H. P. POPE-HARTFORD ENGINE, USED one season, $175; slightly used R. D. Remy Magneto, with coil, $30.00; one A No. 3 Stromberg carbureter, like new, $15.00. Pope-Toledo parts for sale. Auto Salvage and Parts House, 1436 Wabash Ave., Chicago.

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WANTED

WANTED—ONE 1912 5-PASSENGER BODY to fit 1912 Cadillac chassis. Cadillac Automobile Co., Peoria, Ill.

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We have stood the test for 10 years. An enormous Engineering Department. Get lined up for Jan. 1st.

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MECHANICAL ENGINEERS, SUPERIN- tendents, works managers and designers wanted. The Engineering Agency, Inc., Monadnock Blk., Chicago.

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All Radiators repaired
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All work guaranteed by the
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Manufacturers of Radiators, Hoods, Fenders and Tanks. First-class repairing including lamps and windshields. Phone Cal. 4167.

EXPERT REPAIR WORK on Radiators, Hoods, Fenders, Dashes, Tanks and Drip Pans. We guarantee all our work. Arrow Radiator Repair Co., 1331 Wabash Ave., Cal. 1995, Chicago.

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ONLY RADIATOR FACTORY IN NORTHwest. Eleven years' knowing how. Why send your Radiator down East when you can ship it to us; save Time, Express, Freight, Money, and get best workmanship. Prices right. Make new Radiators; allow for old one.

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IGNITION AND LIGHTING APPARATUS repaired successfully where others fail. Parts in stock for all makes. Send your next work to us and be convinced. Catalogue sent free. Pellet's Magneto Exchange, 1463 Michigan Ave., Chicago, Ill.

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Automobile Garage and
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CYLINDERS REBORED, PISTONS AND rings fitted; $8.00 to $12.00 per cyl.; gear cutting in nickel steel, rawhide, fiber, brass, etc. Crankshafts, connecting rods, gear sets, axles, crankcases, reproduced like original; send broken or worn parts to go by. The Shop of Quality.
McCadden Machine Works
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CYLINDERS REGROUND AND FITTED with new pistons and rings from $7 to $11 per cylinder. Gear cutting in steel, brass, rawhide, fiber, etc. Send us your old parts and we will make you new ones like originals, often cheaper than you can get them from the manufacturer. The Crown Machine Shop, Crown Point, Ind.

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WE WILL GUARANTEE A MORE POWerful and efficient motor by regrinding your cylinders, making new pistons and rings, any size, $10 per hole. Merritt Co., 311 W. 59th St., New York City.

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Autogenous welding of all metals, such as crankcases, cylinders, etc. We positively guarantee all work. Tel. Calumet 3563.

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Automobile cylinders and crankcases a specialty. We guarantee the welds.
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BROKEN CRANKSHAFTS, CRANKCASES, cylinders, flywheels, gearteeth, pistons perfectly welded and machined, ready to replace. Scored cylinders made new. Booklet, Atlas Welding Works, Rahway, N. J.

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Cast iron, aluminum and all metals.
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WE WELD AND ABSOLUTELY
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Our welds to hold cylinders (cracked in or outside), crankshafts, aluminum crankcases, transmission cases, housing, etc., by our Oxy-Acetylene process.
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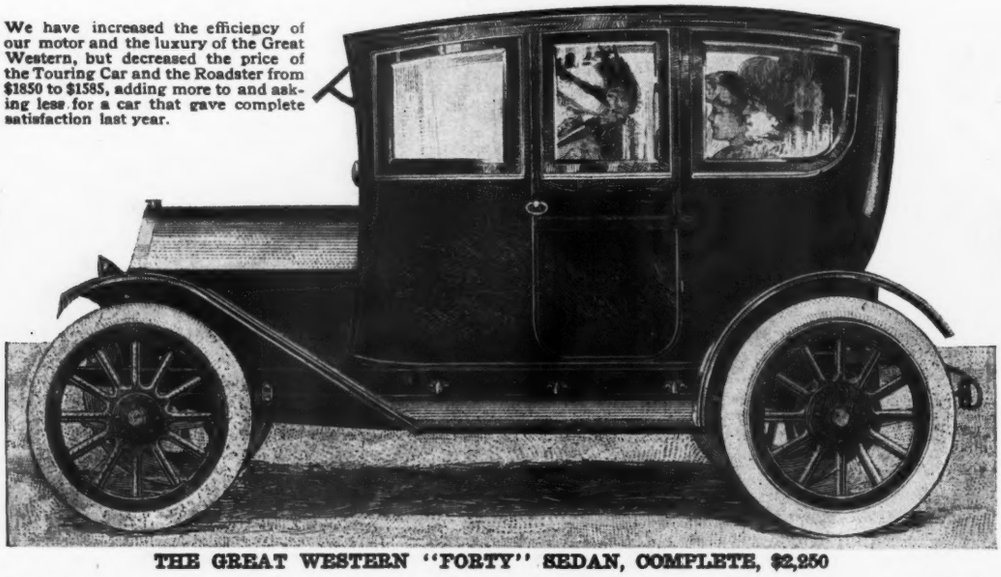

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